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STATISTICAL SUMMARY OF SEWAGE WORKS IN THE UNITED STATES

John R. Thoman, et al

Public Health Service
Washington, D. C.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

43

Statistical Summary of SEWAGE WORKS IN THE UNITED STATES

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Public Health Service

Bureau of State Services
Division of Sanitary Engineering Services
Water Supply and Water Pollution Control Program
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J.

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I

INTRODUCTION

This report summarizes and analyzes data on community sewage works in the United States based on the 1957 Inventory of Municipal and Industrial Wastes Facilities (1). This is the third such study prepared by the Public Health Service (2), (3).

Comprehensive data are presented by States, major drainage basins, and community size groups.

History

The Public Health Service initiated comprehensive activities in the compilation of water and sewage statistics in 1939. Such data have been gathered since that time in varying forms. (For a more complete discussion of Inventory development see Supplement 213—Public Health Reports (3).)

Following passage of the Water Pollution Control Act of 1948 (P. L. 845, 80th Congress), the items collected concerning sewage works were expanded, and data on industrial wastes sources were added. These data were listed by drainage basins and, when analyzed, furnished base information for the development of comprehensive programs for the control of water pollution. At the same time that these data were being assembled, the Public Health Service was continuing the compilation of its Inventory of Water and Sewage Facilities in cooperation with the state health departments. Since both sewage works listings were similar, it was logical that they be combined.

Separate listings were developed; one for water supply facilities, the other for sewage and industrial wastes facilities. The data items included in the latter listing are shown in the form headings reproduced in Figure 1.

Beginning in 1952, these data were requested from the State agency responsible for water pollution control activities. While many States have produced annual revisions of the inventory beginning in 1953, the listings for the entire United States were not available until 1957.

A National Inventory of Sewage and Industrial Wastes Facilities is currently being prepared for printing, and will be available for distribution in the fall of 1958.

Reports as received from the various State agencies were edited and then embossed on metal address plates. Using normal listing equipment which extends lines of data listed vertically on the plates to a horizontal position on the forms, the inventories were printed. While plates are

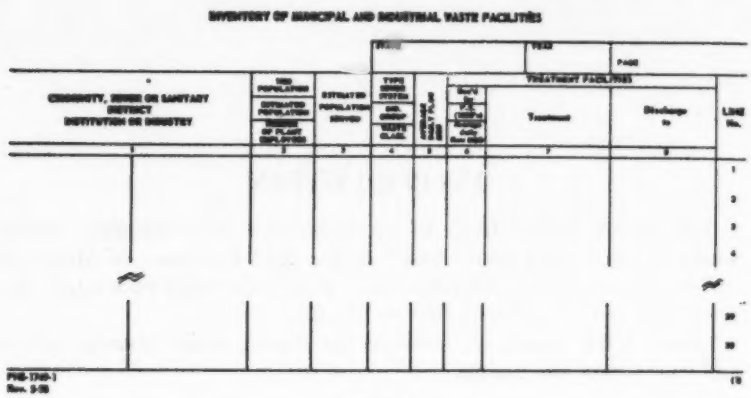

Figure 1.

filed alphabetically within a State, the use of small metal tabs for coding permits the preparation of listings by drainage basins, State administrative regions, or other breakdowns depending on requirements. Corrections of reports are handled by reembossing only the items affected or by complete reembossing depending on the number of corrections.

I. BASIC DATA

Methods

This summary is based on the data contained in the 1957 Inventory of Sewage and Industrial Wastes Facilities; however, 1953 data were the latest available for Alabama, Michigan, and Louisiana. In preparing this summary report only those entries pertaining to municipal sewage facilities were used. All institutional and industry data were eliminated from consideration. The term "municipal" includes not only incorporated and unincorporated communities, but also sanitary districts in their many forms, and such places as mill villages where there is a permanent resident population engaged in the normal domestic pattern of living.

The basic Inventory listings were checked for omissions and irrelevancies, certain data were interpreted for coding, and all pertinent items were punched into cards. Programs were developed and the tabular material produced using modern, high-speed machine tabulating equipment. While this processing method proved superior to older, hand-tabulation procedures, the time necessary for processing due to the wide data spread and the machines' physical limitations indicated the need for programming future summaries using electronic computers.

The basic tabular data are shown in three major classifications: population groups, States, and drainage basins. In one instance, data are grouped by the standard Census Bureau geographical areas.

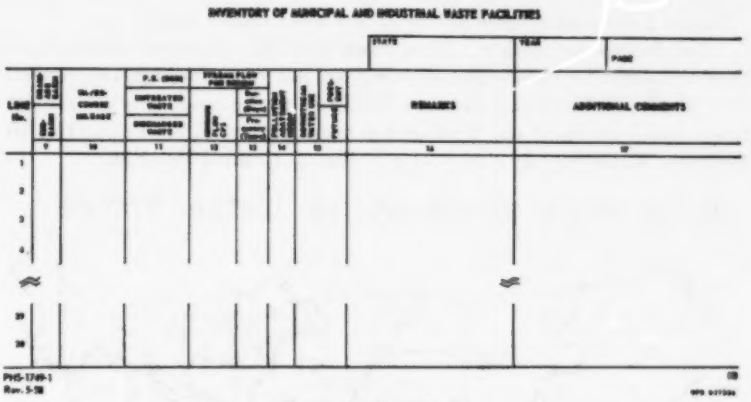

Figure 1—Continued.

Ranges for the population groups used are as follows:

Group	*Population Range*
1	Under 500
2	500–1,000
3	1,000–5,000
4	5,000–10,000
5	10,000–25,000
6	25,000–50,000
7	50,000–100,000
8	100,000 and over

Individual entries were assigned to a particular population group on the basis of the 1950 census population of the community. For those unincorporated places where census data were not available, and where the State water pollution control agency had not furnished a "census" population, data from the 1956 Rand McNally Commercial Atlas were used. Lacking this, the estimated population served was used as the "census" population. Sanitary and other special districts were classified in the group represented by the estimated population served where no "census" population was attributable to the entry.

The United States was divided into drainage basins by the Public Health Service following passage of the Water Pollution Control Act of 1948. With but minor modification, these same basins have been used for this report. The following is the list of the major basins:

Northeast
North Atlantic
Southeast
Tennessee River
Ohio River
Lake Erie
Upper Mississippi
Western Great Lakes
Missouri River
Southwest—Lower Mississippi
Colorado River
Western Gulf
Pacific Northwest
California
Great Basin

Figure 2 delineates these basins on a United States map.

These basins are further broken down into 242 subbasins. Data have been tabulated by these subbasins, but are not reproduced in this report. This detailed information has been furnished to the cooperating organizations, and is on file at the Washington headquarters of the Public Health Service's Water Supply and Water Pollution Control Program.

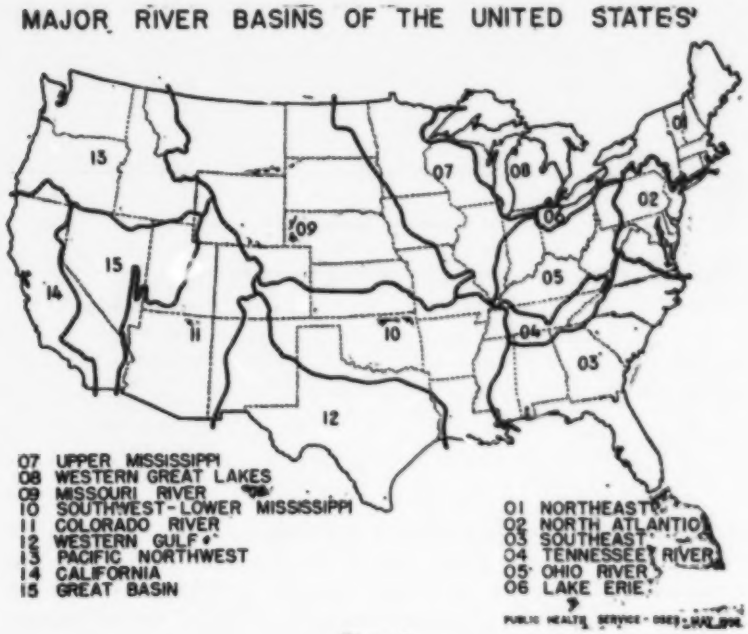

Figure 2.

Data for estimated population served were quite complete in the inventory listing. Where such data were not available, the census populations, rounded to the nearest 10, were used. These cases comprise the only instances where arbitrary procedures were used to add individual data items to the inventory. All other data items are as furnished by the reporting agency.

In the summary data none of the estimated population-served figures has been rounded off, because of inherent difficulties in adjusting several sets of comparable data simultaneously. No fictitious precision is imputed to these data, however, since they are, at best, only estimates.

Summary Data

The basic data produced in this summary are presented in nine tables. National summaries are given in tables 1, 2, and 3 for sewer systems,

sewage disposal and treatment. Detailed data by States, population groups, and major drainage basins are presented in tables 5 through 9, inclusive.

The data in tables 1, 2, and 3 represent a portion of the data appearing in the total columns of the detailed tables. They are presented as separate items for clarity and comparison, and for a quick summary of nationwide conditions.

Both tables 2 and 3 present additive data, as do the corresponding detailed tables (6 and 7). Where more than one type of settling tank was present in a primary plant, the plant was classified in an "other" category. In secondary treatment plants, two or more secondary processes are often present. Rather than present only unit process data which are not additive, secondary plants were arbitrarily assigned to a process on the following basis for table 7. Land application, oxidation ponds, and sand filters were considered subsidiary to either activated sludge or trickling filter processes. As a consequence, where any of these processes followed an activated sludge process or a trickling filter, they were not counted in this table. Both land application and oxidation ponds were considered subsidiary to sand filters. In a very few instances, both trickling filters and the activated sludge process appeared in the same plant. These cases were individually examined and assigned on the basis of professional judgment.

Table 1. *General and treatment summary for the United States*

	Number	Percent
Number of communities		
—with sewer systems	11,131	.....
—discharging raw sewage only	3,065	27.5
—discharging treated sewage only	7,966	71.6
—discharging both raw and treated sewage	100	0.9
Type sewers—number of communities:		
Separate	8,632	[1] 82.1
Combined	1,451	[1] 13.8
Both	428	[1] 4.1
Not stated	620	.....
Census population of sewered communities	102,047,712	.....[1]
Estimated population:		
Connected to sewers	98,361,396	
Discharging raw	21,917,665	22.3
Discharging treated	76,443,731	77.7
TREATMENT		
Treatment plants—total	7,518	100.0
Mince [2]	41	0.6
Primary	2,730	36.3
Intermediate	100	1.3
Secondary	4,647	61.8
Estimated population served by:		
Mince Treatment [2]	1,860,330	2.4
Primary Treatment	25,666,745	33.6
Intermediate Treatment	5,590,952	7.3
Secondary Treatment	43,325,704	56.7

[1] Percent of reported cases, not percent of total communities.
[2] Less than sedimentation.

Table 2. *Primary treatment plant summary for the United States*

Process	Number of plants	Estimated population served	Percent of	
			Number of plants	Estimated population served
Septic tanks	780	986, 561	28. 6	3. 8
Imhoff tanks	1, 084	3, 346, 062	39. 7	13. 0
Mechanically cleaned tanks	656	18, 646, 416	24. 0	72. 7
Plain, hopper bottom tanks	80	1, 344, 385	2. 9	5. 2
Settling tanks—No detail in Inventory	53	1, 019, 261	2. 0	4. 0
Others and Unknown	77	324, 060	2. 8	1. 3
Total	2, 730	25, 666, 745	100. 0	100. 0

Table 3. *Secondary treatment for the United States*

Process	Number of plants	Estimated population served	Percent of	
			Number of plants	Estimated population served
Activated sludge	589	24, 753, 730	12. 7	57. 1
Trickling filters:				
Standard rate	1, 870	9, 351, 062	40. 2	21. 6
High rate	812	5, 962, 844	17. 5	13. 8
Sand filters	394	830, 198	8. 5	1. 9
Land application	340	996, 392	7. 3	2. 3
Oxidation ponds	430	759, 941	9. 2	1. 8
Others and Unknown	212	671, 537	4. 6	1. 5
Total	4, 647	43, 325, 704	100. 0	100. 0

Table 4. *Population connected to sewers and served by disposal facilities—by population groups*

[Estimated Population]

Population size groups	Served by sewage disposal [1] facilities	Connected to sewers	Served by sewage disposal [1] facilities of other communities or sanitary districts	Contributed by other communities for disposal
Under 500	368, 086	421, 226	54, 010	870
500–1,000	1, 207, 421	1, 288, 961	88, 740	7, 300
1,000–5,000	9, 590, 763	10, 681, 868	1, 275, 033	183, 928
5,000–10,000	7, 266, 284	8, 437, 838	1, 375, 455	203, 901
10,000–25,000	11, 128, 680	13, 695, 429	3, 139, 508	572, 759
25,000–50,000	8, 044, 376	10, 276, 364	2, 842, 312	610, 324
50,000–100,000	8, 446, 722	9, 570, 393	2, 406, 466	1, 282, 795
Over 100,000	52, 309, 064	43, 989, 317	8, 959, 054	17, 278, 801
Total	98, 361, 396	98, 361, 396	20, 140, 578	20, 140, 578

[1] "Sewage Disposal—The act of disposing of sewage by any method. The term is not synonymous with *Sewage Treatment.*" Glossary Water and Sewage Control Engineering, American Society of Civil Engineers, 1949.

Data for certain selected processes used in intermediate and secondary treatment plants are presented in table 8. These data are not additive, and both plants and populations have been counted under multiple headings where two or more processes are present in the same plant.

The data reported in table 9 for sludge processing are not additive. Where several processes occurred in one plant, the plant was counted under the various headings. Since it is not possible to distribute the population served among the various processes used in a single plant, such data are not included.

Table 4 presents population served data by the various population groupings, in order to relate them properly to the census population of the communities within each population group. Normal data processing techniques count communities and census populations within the proper group. However, if the sewage is disposed of through another community or a sanitary district, the population served is counted for the group in which the other community or sanitary district falls. Without special treatment of the data, comparisons are not adequate. Column 3 of this table shows the population connected to sewers within the communities of the particular group, while column 2 shows the population which is served by disposal facilities of communities in that group or by special districts classified in that group. Columns 4 and 5 show the population interchange when sewage is disposed of through nonlocal facilities.

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Table 5. *Summary of sewer systems and sewage disposal by population groups, States and drainage basins*

	Number of communities	1950 census population	Estimated population connected to sewers	Type of sewer system			Raw sewage disposal		Treated sewage disposal		Both raw and treated sewage disposal	
				Separate	Combined	Both	Number of communities	Estimated population served	Number of communities	Estimated population served	Number of communities	Estimated population served
POPULATION SIZE GROUPS												
Under 500	1,254	375,495	368,086	1,032	73	7	319	93,109	930	270,617	5	4,360
500–1,000	1,960	1,430,092	1,207,421	1,565	325	24	563	347,625	1,390	854,135	7	5,661
1,000–5,000	5,211	12,941,091	9,590,763	4,164	652	145	1,536	2,736,345	3,638	6,776,414	37	79,804
5,000–10,000	1,267	8,747,686	7,266,284	942	199	79	328	1,683,245	926	5,507,384	13	75,655
10,000–25,000	889	13,517,578	11,128,680	632	148	85	205	2,586,930	672	8,321,220	12	220,530
25,000–50,000	299	10,204,058	8,044,376	178	70	44	65	1,970,307	225	5,776,939	9	297,130
50,000–100,000	134	9,440,613	8,446,722	67	46	20	30	2,081,090	101	6,092,632	3	273,000
Over 100,000	117	45,391,099	52,309,064	52	38	24	19	5,206,448	84	35,818,116	14	11,784,500
STATES												
Alabama	176	1,350,133	1,063,050	171	.....	.....	74	408,065	96	518,385	6	136,650
Arizona	93	385,739	499,563	91	1	.....	7	21,850	86	477,712	.....	.....
Arkansas	140	741,480	607,725	134	2	.....	31	242,840	108	358,885	1	6,000
California	651	9,753,763	10,492,872	629	11	2	38	218,483	610	9,393,089	3	881,300
Colorado	164	936,264	1,072,945	144	4	1	39	63,394	124	1,007,851	1	1,700
Connecticut	75	1,483,392	1,305,260	35	16	10	16	64,400	54	1,173,860	5	67,000
Delaware	53	192,756	184,220	19	5	.....	10	14,650	43	169,570	.....	.....
District of Columbia	1	802,178	1,240,000	.....	.....	1	.....	.....	1	1,240,000	.....	.....
Florida	215	1,675,448	1,524,489	144	2	.....	36	381,395	178	1,116,094	1	27,000
Georgia	216	1,579,659	1,322,280	197	1	4	65	444,550	147	782,830	4	94,900
Idaho	98	289,827	259,265	81	12	.....	46	137,895	52	121,370	.....	.....
Illinois	519	7,760,337	7,490,946	329	161	19	53	373,125	465	7,115,041	1	2,780
Indiana	289	2,416,912	2,368,040	88	197	2	153	388,938	136	1,979,102	.....	.....
Iowa	395	1,533,376	1,317,740	357	19	9	78	372,850	316	943,080	1	1,810
Kansas	287	1,173,151	1,194,355	277	1	3	37	238,820	249	886,535	1	79,000
Kentucky	142	1,008,766	1,004,645	109	27	5	51	97,875	89	874,370	2	32,400
Louisiana	105	1,451,092	1,285,957	99	1	.....	36	938,423	69	347,534	.....	.....
Maine	134	599,737	509,277	29	57	11	115	394,951	10	50,295	9	64,051
Maryland	120	1,491,676	1,140,930	103	8	3	23	45,810	97	1,095,120	.....	.....
Massachusetts	164	4,162,114	3,641,240	91	36	35	55	602,950	107	2,425,290	2	613,000
Michigan	349	4,456,232	4,356,127	128	148	33	175	620,680	172	3,734,532	2	915
Minnesota	490	1,903,548	1,583,910	351	43	2	95	122,936	395	1,461,874	.....	.....
Mississippi	128	692,493	583,660	127	.....	.....	52	392,930	76	190,730	.....	.....
Missouri	312	2,544,660	2,160,301	253	8	22	103	1,550,786	207	577,225	2	32,290
Montana	112	335,399	331,155	104	5	.....	30	172,720	80	148,585	2	9,850

Nebraska	253	794,337	724,622	235	13	5	88	198,875	164	299,247	1	240,000
Nevada	40	126,928	179,960	36	4	.....	7	9,116	33	170,844	.....	.....
New Hampshire	69	375,066	279,300	42	11	.....	55	236,900	14	52,400	.....	.....
New Jersey	282	4,108,568	4,028,148	247	17	1	8	74,140	272	3,881,708	2	72,500
New Mexico	65	367,875	495,385	65	.....	.....	1	1,000	64	494,385	.....	.....
New York	502	12,542,667	12,487,854	405	41	30	150	807,954	342	3,447,200	10	8,232,700
North Carolina	308	1,542,470	1,536,825	307	.....	.....	95	439,760	207	1,048,010	6	49,055
North Dakota	137	281,049	263,000	81	48	.....	19	53,350	118	209,650	.....	.....
Ohio	515	5,738,799	5,875,328	273	127	52	149	582,811	361	4,659,732	5	632,785
Oklahoma	243	1,293,418	1,162,033	241	.....	.....	11	51,390	232	1,110,643	.....	.....
Oregon	142	840,794	830,180	99	34	7	24	47,100	117	399,080	1	384,000
Pennsylvania	908	8,228,877	7,372,533	562	169	79	536	3,087,332	372	4,245,741	10	39,460
Rhode Island	28	645,077	541,590	20	6	2	8	3,930	20	537,660	.....	.....
South Carolina	161	805,756	722,835	157	.....	.....	38	291,065	121	420,420	2	11,350
South Dakota	158	318,267	312,735	125	21	12	31	43,235	126	262,900	1	6,600
Tennessee	126	1,488,971	1,485,602	118	3	.....	41	644,679	83	674,723	2	166,200
Texas	664	5,200,795	5,041,670	650	2	.....	14	100,750	650	4,940,920	.....	.....
Utah	85	499,964	503,291	81	1	.....	27	299,405	58	203,886	.....	.....
Vermont	78	191,666	161,545	31	46	.....	70	126,245	8	35,300	.....	.....
Virginia	163	1,257,475	1,241,829	146	2	.....	57	420,670	108	782,514	3	38,645
Washington	207	1,599,663	1,550,692	131	47	17	49	304,415	151	509,287	7	736,990
West Virginia	164	726,436	627,593	100	44	18	132	444,173	27	110,549	5	72,871
Wisconsin	428	2,271,729	2,208,164	331	50	43	20	85,120	407	2,121,956	1	1,088
Wyoming	67	181,353	188,731	59	.....	.....	27	64,988	39	117,793	1	5,950
Major Drainage Basins												
Northeast	888	10,739,078	9,740,722	523	204	79	439	2,037,901	436	6,652,070	23	1,050,751
North Atlantic	1,211	22,184,500	21,644,103	883	122	43	345	1,843,905	858	11,762,248	8	6,037,950
Southeast	1,108	7,373,430	6,495,399	1,010	3	4	302	2,126,435	789	4,071,269	17	297,695
Tennessee River	143	952,710	1,033,999	133	2	.....	62	298,859	76	545,385	5	189,755
Ohio River	1,357	9,940,542	9,498,465	802	385	111	705	3,469,790	635	5,282,444	17	766,231
Lake Erie	217	2,838,634	2,930,472	96	77	19	65	138,748	148	2,783,739	4	7,985
Upper Mississippi	1,548	12,985,290	11,917,719	1,167	271	64	271	1,745,238	1,274	10,164,923	3	7,558
Western Great Lakes	571	6,412,700	6,272,328	283	195	51	194	680,136	375	5,591,277	2	915
Missouri River	1,129	4,194,988	4,031,638	984	70	30	269	1,306,621	853	2,358,797	7	366,220
Southwest–Lower Mississippi	934	5,732,222	5,266,403	914	5	.....	166	1,829,111	767	3,431,292	1	6,000
Colorado River	189	580,514	740,915	182	3	1	29	46,561	139	690,054	1	4,300
Western Gulf	624	5,076,721	4,979,320	612	2	.....	17	108,655	607	4,870,665	.....	.....
Pacific Northwest	464	2,767,604	2,782,850	323	96	24	131	571,810	324	1,987,060	9	1,123,980
California	699	9,633,044	10,358,221	587	11	2	34	187,955	573	9,291,836	2	878,430
Great Basin	139	635,735	668,842	133	5	.....	36	333,574	102	332,398	1	2,870
Total	11,131	102,047,712	98,361,396	8,632	1,451	428	3,665	16,705,299	7,966	68,915,457	100	12,740,640

Table 5. *Summary of sewer systems and sewage disposal by population groups, States and drainage basins—Continued*

	Raw sewage disposal		Treated sewage disposal		Sewage treatment plants							
					Minor		Primary		Intermediate		Secondary	
	Number of systems	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Population Size Groups												
Under 500	294	93,914	808	274,172	1	460	317	98,728			490	175,044
500–1,000	552	352,220	1,322	855,201	4	2,790	550	340,973	4	4,556	764	506,882
1,000–5,000	1,527	2,788,116	3,468	6,802,647	15	27,940	1,307	2,189,222	20	51,920	2,126	4,533,565
5,000–10,000	315	1,732,910	863	5,533,374	3	28,050	242	1,602,816	21	208,974	597	3,693,534
10,000–25,000	210	2,712,660	595	8,416,020	6	766,490	156	1,996,612	20	327,205	413	5,325,713
25,000–50,000	74	2,091,107	199	5,953,269	1	30,000	71	2,159,357	17	558,825	110	3,205,087
50,000–100,000	38	2,144,290	99	6,302,432	6	454,160	25	1,524,790	6	344,752	62	3,978,730
Over 100,000	38	10,002,448	164	42,306,616	5	550,500	62	15,[illegible]6,247	12	4,994,720	85	21,907,149
States												
Alabama	98	509,590	120	553,460			94	435,150	1	30,000	25	88,310
Arizona	7	21,850	82	477,712			23	89,625	3	42,500	56	395,587
Arkansas	32	246,840	119	360,885			80	165,485	2	3,200	37	192,200
California	41	241,463	450	10,251,409	3	124,560	119	5,929,213	4	276,200	324	3,921,496
Colorado	40	63,594	108	1,009,351			50	90,872	4	635,987	54	282,492
Connecticut	21	101,400	66	1,203,860	2	16,000	41	944,645	2	96,360	21	146,855
Delaware	10	14,650	9	169,570	1	50	7	167,770			1	1,750
District of Columbia			1	1,240,000			1	1,240,000				
Florida	35	394,895	188	1,129,594	1	30,000	81	451,260	1	35,000	105	613,334
Georgia	68	521,850	165	800,430			108	195,980	1	204,000	56	400,450
Idaho	46	137,895	52	121,370	1	460	30	22,020	1	3,200	20	95,750
Illinois	48	375,905	381	7,115,041			72	522,640	3	72,850	306	6,519,551
Indiana	154	388,938	138	1,979,102			32	285,365	1	6,000	105	1,687,737
Iowa	79	372,950	332	914,790			37	90,447	1	3,580	294	850,843
Kansas	36	242,020	250	952,335			37	336,145			213	616,190
Kentucky	53	126,525	84	878,120			25	451,890	3	147,680	56	278,550
Louisiana	35	938,423	72	347,534			19	41,042			53	306,492
Maine	149	453,601	20	55,676	1	500	15	53,700			4	1,476
Maryland	23	45,810	52	1,095,120	3	5,580	31	203,163			18	886,377
Massachusetts	58	1,064,130	68	2,577,110	8	990,100	13	1,027,000			47	552,010
Michigan	175	621,295	144	3,734,832	1	1,630	82	2,836,425	6	120,389	55	776,388
Minnesota	95	122,036	279	1,451,874			101	138,400	2	900,000	176	423,474
Mississippi	52	392,930	79	190,730			52	86,750			27	103,960

Missouri	71	1,576,286	236	584,015			39	46,275	1	1,200	196	536,540
Montana	28	182,120	82	149,035			38	88,135	3	21,500	41	39,400
Nebraska	90	375,375	164	349,247	1	610	54	41,179	3	2,150	126	305,317
Nevada	7	9,116	32	170,844			6	8,830			26	162,014
New Hampshire	55	226,900	15	52,400			10	49,300			5	3,100
New Jersey	10	94,340	224	3,933,808	1	760	81	2,623,893	7	198,200	135	1,110,955
New Mexico	1	1,000	69	494,385			7	16,785			62	477,600
New York	154	3,653,354	308	8,834,500	7	624,500	199	2,458,735	5	535,615	97	5,215,650
North Carolina	101	463,315	279	1,073,510	3	8,600	161	220,079	1	2,530	114	842,301
North Dakota	19	53,350	116	209,650			49	66,260			67	143,390
Ohio	134	1,044,096	297	4,831,232			91	853,763	20	492,845	186	3,484,624
Oklahoma	11	51,390	246	1,110,643			45	55,505	2	27,600	199	1,027,538
Oregon	25	67,100	117	763,080			51	570,150			66	192,930
Pennsylvania	448	3,093,567	290	4,278,966			122	549,255	7	1,447,456	161	2,282,255
Rhode Island	8	3,930	16	537,660			8	157,710			8	379,950
South Carolina	52	298,015	167	424,820	3	5,900	119	170,270			45	248,650
South Dakota	32	47,935	127	264,800			48	32,770			79	232,030
Tennessee	43	804,779	88	680,823			49	211,153			39	469,670
Texas	13	100,750	669	4,940,920			122	169,525			547	4,771,395
Utah	18	299,405	58	203,886			33	46,402			25	157,484
Vermont	71	126,245	8	35,300			8	35,300				
Virginia	60	426,350	94	815,479	3	25,900	41	509,479			50	280,100
Washington	53	893,805	155	656,887	2	17,300	72	390,275	2	10,500	79	238,812
West Virginia	139	472,339	29	155,254			17	101,490			12	53,764
Wisconsin	21	86,275	333	2,121,889			114	415,869	12	255,690	207	1,450,330
Wyoming	29	67,938	40	120,793			16	23,380	2	18,800	22	78,613
Major Drainage Basins												
Northeast	485	2,660,851	392	7,079,871	12	1,119,600	232	4,194,970	5	156,975	143	1,608,336
North Atlantic	343	4,650,905	631	16,993,198	13	539,540	261	5,522,885	14	2,093,156	343	8,837,617
Southeast	349	2,331,415	953	4,163,984	8	56,750	577	1,505,099	4	271,530	364	2,330,605
Tennessee River	64	477,689	85	556,310			53	202,625			32	353,685
Ohio River	626	3,963,741	599	5,534,724			214	1,387,718	20	611,650	365	3,535,356
Lake Erie	67	146,433	110	2,784,039			31	596,915	6	62,375	73	2,124,749
Upper Mississippi	233	1,752,398	1,156	10,165,321			286	977,276	7	872,745	863	8,315,300
Western Great Lakes	195	680,926	299	5,591,402	1	1,630	131	3,081,975	16	480,884	149	2,036,913
Missouri River	276	1,533,771	867	2,497,867	1	610	243	340,963	8	605,250	615	1,551,044
Southwest-Lower Mississippi	165	1,833,111	799	3,433,292			240	650,906	5	84,827	554	2,697,559
Colorado River	31	49,361	154	691,554			63	95,523	4	46,860	87	549,171
Western Gulf	17	108,655	628	4,870,665			101	151,930			527	4,718,735
Pacific Northwest	133	1,183,900	329	1,598,950	3	17,700	156	988,995	3	21,500	167	570,755
California	36	208,485	412	10,149,736	3	124,500	115	5,920,828	4	276,200	290	3,828,208
Great Basin	28	336,024	104	332,818			27	48,137	2	7,000	75	277,681
Total	3,048	21,917,665	7,518	76,443,731	41	1,860,330	2,730	25,666,745	106	5,590,952	4,647	43,325,704

Table 6. *Summary of primary treatment plants by population groups, States and drainage basins*

	Total		Septic tanks		Imhoff tanks		Mechanically cleaned tanks		Plain, hopper bottom tanks		Tanks with no details in listing		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Population Size Groups														
Under 500	317	98, 728	153	39, 564	135	49, 777	15	5, 925	9	2, 294	2	893	3	275
500–1,000	550	340, 973	187	100, 573	266	166, 860	54	45, 515	24	15, 235	5	3, 670	14	9, 120
1,000–5000	1, 307	2, 189, 222	383	537, 750	575	856, 543	251	612, 815	35	58, 656	28	56, 688	35	66, 770
5,000–10,000	242	1, 602, 816	38	149, 674	59	250, 802	121	1, 046, 490	4	24, 500	6	51, 830	14	79, 520
10,000–25,000	156	1, 996, 612	15	99, 250	22	266, 650	106	1, 479, 737	4	51, 900	4	57, 500	5	41, 575
25,000–50,000	71	2, 159, 357	2	53, 300	10	233, 480	50	1, 683, 027	1	19, 200	3	74, 550	5	95, 800
50,000–100,000	25	1, 524, 790			6	405, 320	16	1, 002, 740	1	62, 600	2	54, 130		
Over 100,000	62	15, 754, 247	2	6, 450	11	1, 116, 630	43	12, 770, 167	2	1, 110, 000	3	720, 000	1	31, 000
States														
Alabama	94	435, 150	50	46, 355	28	30, 295	15	354, 500					1	4, 000
Arizona	23	39, 625	11	12, 985	7	21, 240	1	4, 000	4	1, 400				
Arkansas	80	165, 485	13	21, 085	23	32, 470	29	95, 330	15	16, 600				
California	119	5, 929, 213	44	38, 352	13	16, 469	51	5, 174, 617			5	667, 450	6	32, 325
Colorado	50	90, 872	18	18, 193	15	13, 509	14	51, 920	1	1, 250	1	500	1	5, 500
Connecticut	41	944, 645	10	16, 350	3	38, 200	16	738, 700	4	21, 770	4	115, 750	4	13, 875
Delaware	7	167, 770	1	800	2	3, 230	2	157, 000	2	6, 740				
District of Columbia	1	1, 240, 000					1	1, 240, 000						
Florida	81	451, 260	34	62, 980	11	7, 810	32	316, 420	2	5, 400	1	50, 000	1	8, 650
Georgia	108	195, 980	32	35, 680	50	52, 450	21	73, 400	1	800			4	33, 650
Idaho	30	22, 020	22	11, 970	5	5, 000	3	5, 050						
Illinois	72	522, 640	14	30, 590	29	69, 710	25	416, 610	4	5, 730				
Indiana	32	285, 365	5	9, 520	9	13, 000	18	262, 345						
Iowa	37	90, 447	27	16, 667	9	3, 780	1	70, 000						
Kansas	37	336, 145	3	3, 530	23	30, 415	9	299, 900					2	2, 300
Kentucky	25	451, 890	11	20, 420	9	31, 890	3	397, 870			1	1, 710	1	
Louisiana	19	41, 042	9	12, 600	7	15, 742	1	10, 000	1	2, 200			1	500
Maine	15	53, 700	11	44, 760	3	8, 340							1	600
Maryland	31	203, 163	4	1, 085	19	20, 078	6	167, 500	2	14, 500				
Massachusetts	13	1, 027, 000			1	320	12	1, 026, 680						
Michigan	82	2, 836, 425	22	31, 595	16	307, 670	37	2, 412, 990	4	7, 370	2	51, 000	1	25, 800
Minnesota	101	138, 400	3	3, 920	77	60, 406	16	70, 085	4	989			1	3, 000
Mississippi	52	86, 750	38	44, 350	10	20, 200	2	19, 200					2	3, 000
Missouri	39	46, 275	14	4, 460	19	19, 615	5	22, 100	1	100				
Montana	38	88, 135	23	22, 855	8	7, 080	4	54, 050	1	2, 800	1	1, 300	1	50

Nebraska	34	41,170	15	30,710	17	8,930	1	800	1	730				
Nevada	6	8,830	3	2,780	1	1,800	2	4,250						
New Hampshire	10	49,300	5	7,300	3	20,400	2	21,600						
New Jersey	81	2,623,893	22	132,715	18	245,805	23	973,125	5	1,174,150	12	58,598	1	39,500
New Mexico	7	16,785	3	1,485	4	15,300								
New York	199	2,458,735	36	73,721	81	789,100	60	1,512,149	10	60,065	2	4,000	10	19,700
North Carolina	161	220,079	43	37,978	95	105,186	16	70,615	7	6,300				
North Dakota	49	66,260	18	17,270	30	20,990	1	28,000						
Ohio	91	853,763	11	7,330	53	496,943	25	345,990			1	1,500	1	2,000
Oklahoma	45	55,505	21	13,430	22	22,075	1	19,800					1	200
Oregon	51	570,150	11	4,500	7	5,500	31	558,550	2	1,600				
Pennsylvania	122	549,255	16	11,235	55	173,490	21	264,670	1	1,500	2	15,400	27	82,960
Rhode Island	8	157,710	3	1,250	1	10,000	4	146,460						
South Carolina	119	170,270	54	54,160	55	60,860	9	54,250					1	1,000
South Dakota	48	32,770	1	750	45	28,120	1	2,000					1	1,900
Tennessee	49	211,153			24	64,335	7	103,805	1	1,200	17	41,813		
Texas	122	169,525	19	18,205	95	125,520	1	5,200	1	4,400	1	1,200	5	15,000
Utah	33	46,402	22	24,000	7	9,487	3	10,100	1	2,815				
Vermont	8	35,300	5	1,000			1	8,100	1	200			1	26,000
Virginia	41	509,479	12	12,535	18	24,654	8	243,250			3	9,040		
Washington	72	390,275	20	12,200	20	24,320	32	353,755						
West Virginia	17	101,490	8	5,350	6	8,140	3	88,000						
Wisconsin	114	415,869	6	3,125	25	19,888	79	389,080	4	3,776				
Wyoming	16	23,380	7	2,430	6	16,300	1	2,100					2	2,550
Major Drainage Basins														
Northeast	232	4,194,970	60	114,451	68	702,580	74	3,133,379	13	75,135	4	115,750	13	53,675
North Atlantic	261	5,522,885	46	176,885	92	679,847	69	3,273,785	12	1,203,790	19	87,038	23	101,540
Southeast	577	1,505,099	222	247,458	242	263,331	94	883,010	10	12,500	1	50,000	8	48,800
Tennessee River	53	202,625	12	16,915	25	62,170	8	97,880	1	1,200	7	24,460		
Ohio River	214	1,387,718	46	56,920	104	274,638	51	1,024,240			3	2,500	10	29,430
Lake Erie	31	596,915	6	3,735	17	448,875	7	142,805			1	1,500		
Upper Mississippi	286	977,276	52	44,557	120	113,394	101	805,955	12	10,370			1	3,000
Western Great Lakes	131	3,081,975	24	32,595	37	350,945	62	2,614,040	5	7,595	2	51,000	1	25,800
Missouri River	243	340,963	74	78,864	137	116,169	21	132,550	3	4,780	3	1,800	6	6,800
Southwest-Lower Mississippi	240	650,906	75	79,561	99	133,502	38	398,280	16	18,800	4	16,563	4	4,200
Colorado River	63	95,523	33	31,263	18	30,125	6	24,420	5	4,215			1	5,500
Western Gulf	101	151,930	18	15,320	75	111,310	2	6,700	1	4,400	1	1,200	4	13,000
Pacific Northwest	156	988,995	56	34,120	30	31,820	68	921,455	2	1,600				
California	115	5,920,828	40	29,967	13	16,469	51	5,174,617			5	667,450	6	32,325
Great Basin	27	48,137	16	23,950	7	10,887	4	13,300						
Total	2,730	25,666,745	780	986,561	1,084	3,346,062	656	18,646,416	80	1,344,385	53	1,019,261	77	324,060

Table 7. *Summary of secondary treatment plants by population groups, States and drainage basins*

	Total secondary treatment		Activated sludge		Trickling filter standard rate		Trickling filter high rate		Intermittent sand filter		Application to land		Oxidation ponds		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
POPULATION SIZE GROUPS																
Under 500	490	175,044	26	9,859	131	46,057	42	39,466	89	20,183	76	17,916	101	34,413	25	7,150
500–1,000	764	506,882	53	36,831	317	212,492	106	79,430	105	60,370	56	31,528	101	71,926	26	14,305
1,000–5,000	2,126	4,533,565	213	481,576	913	1,893,378	364	935,365	154	253,190	168	354,793	197	348,111	117	267,152
5,000–10,000	597	3,693,534	80	561,373	271	1,596,565	146	1,016,090	25	119,465	27	148,670	23	131,991	25	119,380
10,000–25,000	413	5,325,713	95	1,342,240	165	1,860,152	108	1,529,636	17	227,890	7	124,485	4	48,000	17	193,310
25,000–50,000	110	3,205,087	40	1,272,135	31	728,395	30	914,507	2	37,800	4	175,000	2	76,500	1	750
50,000–100,000	62	3,978,730	30	1,855,730	18	1,182,860	9	615,350	2	111,300	2	144,000			1	69,490
Over 100,000	85	21,907,149	52	19,193,986	24	1,831,163	7	833,000					2	49,000		
STATES																
Alabama	25	88,310			16	42,690	6	44,100	1	1,000	2	520				
Arizona	56	395,587	2	254,000	5	40,500	1	11,500	4	25,300	17	10,379	27	53,908		
Arkansas	37	192,200			7	42,050	28	148,400	2	1,750						
California	324	3,921,496	19	2,369,075	56	348,237	51	442,146			134	489,968	53	203,651	11	68,419
Colorado	54	282,492			13	47,795	16	156,912			9	58,710	16	19,075		
Connecticut	21	146,855	2	7,250	4	13,200	1	25,000	12	81,230	1	175			1	20,000
Delaware	1	1,750			1	1,750										
District of Columbia																
Florida	105	613,334	12	278,800	2	15,500	67	294,155	18	11,479	2	6,000	4	7,400		
Georgia	56	400,450			49	369,000	4	20,950	1	1,000					2	9,500
Idaho	20	95,750	2	29,000	4	25,500	10	38,800			3	850	1	1,600		
Illinois	306	6,519,551	72	5,512,105	160	566,541	38	390,965	22	32,755			13	14,815	1	2,370
Indiana	105	1,687,737	49	1,398,565	37	171,720	17	117,302	2	150						
Iowa	294	850,843	2	22,000	190	726,778	15	35,800	84	65,365	2	400				500
Kansas	213	616,190	9	108,400	165	414,905	3	58,000	24	22,820			9	9,995	3	2,070
Kentucky	56	278,550	3	15,860	35	185,865	18	76,825								
Louisiana	53	306,492	10	136,500	36	127,062	6	42,680	1	250						
Maine	4	1,476							1	120	1	16			2	1,340
Maryland	18	886,377	3	831,500	10	28,887	4	25,590	1	400						
Massachusetts	47	552,010	1	22,000	11	83,350	7	246,200	27	200,360	1	100				
Michigan	55	776,388	20	412,110	18	301,373	2	13,910	12	41,220	2	6,210			1	1,565
Minnesota	176	423,474	8	12,890	76	161,054	86	240,335	2	2,900			4	6,295		
Mississippi	27	103,980	4	31,100	6	33,000	10	31,430	3	2,950			4	5,500		
Missouri	196	536,540	26	104,661	124	314,304	7	16,450	21	10,830	1	1,000	16	19,805	1	69,490
Montana	41	39,400	5	5,300	1	3,000			4	5,130	8	3,460	22	22,360	1	150

Nebraska	126	305,317	40	109,265	57	167,526	2	14,000	8	5,330	2	2,080	17	7,116		
Nevada	26	162,014	1	225	2	1,250	5	129,700			10	12,049	8	16,790		
New Hampshire	5	3,100			3	2,270	1	680	1	150						
New Jersey	135	1,110,955	18	393,535	51	423,053	9	45,219	25	143,390	1	8,150			31	97,608
New Mexico	62	477,600			16	63,850	23	371,940			8	21,100	13	15,610	2	5,100
New York	97	5,215,650	15	4,692,000	47	353,180	6	79,800	21	66,370	2	1,150			6	23,150
North Carolina	114	842,301	13	324,240	40	382,115	17	100,942	39	29,934	1	1,600	2	1,370	2	2,100
North Dakota	67	143,390	1	6,100	11	79,600	1	8,000			11	8,500	43	41,190		
Ohio	186	3,484,624	74	2,740,664	67	582,520	18	115,745	25	40,785					2	4,910
Oklahoma	199	1,027,538	12	197,520	139	435,142	19	313,480	2	2,705			26	73,691	1	5,000
Oregon	66	192,930	6	11,230	21	66,400	30	107,400	3	600	3	4,900	3	2,400		
Pennsylvania	161	2,282,255	36	1,444,405	63	573,030	22	141,200	4	10,900	4	1,400	1	900	31	110,420
Rhode Island	8	379,950	4	359,300	2	19,450			1	800			1	400		
South Carolina	45	248,650	7	19,400	24	126,250	11	101,000	2	800			1	1,200		
South Dakota	79	232,030	3	62,750	40	120,750	3	17,800	3	2,700	1	1,300	29	26,730		
Tennessee	39	469,670	9	110,950	21	327,240	6	20,980	1	500					2	10,000
Texas	547	4,771,395	42	1,477,190	99	1,152,690	122	1,402,405	6	5,130	78	329,345	95	176,290	105	228,345
Utah	25	157,484			7	62,190	12	91,108			4	3,386	2	800		
Vermont																
Virginia	50	280,100	8	181,320	29	58,500	6	31,480	1	300	1	100			5	8,400
Washington	79	238,812	6	36,970	4	30,360	48	150,565	1	300	16	16,495	4	4,122		
West Virginia	12	53,764	1	14,000	5	38,600					6	1,164				
Wisconsin	207	1,450,330	44	1,021,550	92	169,735	54	241,950	8	12,395	5	2,285	4	2,415		
Wyoming	22	78,613			4	51,300			2	500	3	3,200	12	22,513	1	1,100
MAJOR DRAINAGE BASINS																
Northeast	143	1,608,326	10	488,050	57	442,665	11	317,180	54	330,600	4	441	1	400	6	28,990
North Atlantic	343	8,837,617	65	7,173,780	137	1,004,375	35	254,399	37	172,490	5	10,050	1	900	63	221,623
Southeast	364	2,330,605	37	721,940	137	949,155	110	581,277	61	44,513	5	8,120	9	13,300	5	12,300
Tennessee River	32	353,685	6	67,950	18	278,135	4	6,080	3	950			1	570		
Ohio River	365	3,535,356	94	1,977,540	165	1,095,200	60	402,912	27	33,665	9	2,164	1	900	9	22,975
Lake Erie	73	2,124,749	40	1,997,534	20	83,395	6	31,500	6	10,780					1	1,540
Upper Mississippi	863	8,315,300	116	6,028,520	449	1,509,291	161	647,132	88	82,327	10	5,685	38	39,975	1	2,370
Western Great Lakes	149	2,026,913	47	1,398,520	55	402,218	27	171,905	15	46,075	3	6,310	1	320	1	1,565
Missouri River	615	1,551,044	66	316,236	301	794,200	27	234,823	69	58,443	23	18,040	123	125,482	6	3,820
Southwest-Lower Mississippi	554	2,697,559	29	497,820	338	1,157,661	82	737,722	21	19,425	21	78,395	55	121,176	8	85,360
Colorado River	87	549,171	3	254,225	9	53,290	11	132,300	4	25,300	22	15,424	38	68,632		
Western Gulf	527	4,718,735	42	1,382,690	93	1,049,330	126	1,568,395	5	4,730	69	327,615	91	163,400	101	222,575
Pacific Northwest	167	570,755	15	79,850	28	119,460	88	338,065	4	900	21	21,945	11	10,535		
California	290	3,828,208	19	2,369,075	53	335,440	50	433,510			114	443,118	45	191,646	9	55,419
Great Basin	75	277,681			10	77,247	14	105,644			34	59,085	15	22,705	2	13,000
Total	4,647	43,325,704	589	24,753,730	1,870	9,351,062	812	5,962,844	394	830,198	340	996,392	430	759,941	212	671,537

417749—69——8

Table 8. *Summary of selected intermediate and secondary treatment processes by population groups, States and drainage basins*

	Chemical treatment		Activated sludge		Trickling filter standard rate		Trickling filter high rate		Intermittent sand filter		Application to land		Oxidation ponds	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
POPULATION SIZE GROUPS														
Under 500			26	9,859	135	47,147	43	39,766	89	20,183	87	21,531	114	38,500
500–1,000	8	8,006	53	36,831	320	214,382	110	81,620	105	60,370	70	41,144	127	87,746
1,000–5,000	76	202,275	216	490,426	956	2,002,642	378	959,640	156	258,230	217	503,158	304	582,878
5,000–10,000	60	459,172	83	584,573	283	1,676,065	159	1,088,228	25	119,465	45	364,670	52	326,791
10,000–25,000	60	853,355	101	1,457,330	184	2,132,872	117	1,696,206	18	246,690	29	514,302	23	322,027
25,000–50,000	26	885,757	41	1,336,135	36	880,095	34	1,009,107	3	39,000	8	282,500	4	178,500
50,000–100,000	11	592,022	31	1,929,430	22	1,479,650	11	765,350	2	111,300	4	329,000	2	170,000
Over 100,000	14	4,319,720	52	19,193,986	28	2,900,163	8	895,000			1	10,000	5	656,400
STATES														
Alabama	1	30,000			16	42,690	6	44,100	1	1,000	2	520		
Arizona	4	50,500	2	254,000	5	40,500	1	11,500	4	25,300	18	15,879	30	75,608
Arkansas	4	11,100			7	42,050	28	148,400	2	1,750				
California	12	391,300	22	2,438,075	62	383,906	53	453,746			193	969,741	114	469,838
Colorado	5	688,987			13	47,795	16	156,912			9	58,710	19	23,897
Connecticut	2	96,360	2	7,250	5	36,200	1	25,000	13	84,730	1	175		
Delaware					1	1,750								
District of Columbia														
Florida	1	35,000	12	278,800	3	18,600	72	328,755	18	11,479	2	6,000	8	22,900
Georgia	4	298,000			50	381,000	4	20,950	1	1,000				
Idaho	3	25,200	2	29,000	4	25,500	10	38,800			3	850	1	1,600
Illinois	5	121,050	73	5,515,205	166	649,031	42	518,415	22	32,755			19	31,155
Indiana	11	242,677	49	1,398,565	39	173,460	17	117,302	2	150				
Iowa	35	373,400	2	22,000	198	751,088	21	47,000	84	65,365	2	400		
Kansas			10	116,400	166	429,905	4	65,500	24	22,820	2	3,100	32	48,135
Kentucky	6	161,730	3	15,860	35	185,865	18	76,825						
Louisiana			10	136,500	36	127,062	7	57,680	1	250				
Maine									1	120	1	16		
Maryland	3	13,445	3	831,500	11	828,887	4	25,590			1	400		
Massachusetts			1	22,000	14	199,650	9	268,770	27	200,360	4	14,725		
Michigan	7	123,359	21	485,810	21	322,603	2	13,910	13	60,020	2	6,210		
Minnesota	9	969,170	8	12,890	81	170,854	87	241,935	2	2,900			6	16,725
Mississippi			4	31,100	6	33,000	10	31,430	3	2,950			4	5,500

Missouri	1	1,200	26	104,661	126	385,894	8	16,750	21	10,830	1	1,000	16	19,805
Montana	3	21,500	5	5,300	1	3,000	.....	.....	4	5,130	9	3,910	23	22,840
Nebraska	4	2,950	40	109,265	57	167,526	2	14,000	8	5,330	12	12,190	18	7,538
Nevada	.....	.....	1	225	2	1,250	5	129,700	.....	.....	14	90,499	9	19,590
New Hampshire	.....	.....	.....	.....	3	2,270	1	680	1	150	1	150	.....	.....
New Jersey	28	393,790	18	393,535	55	481,853	10	69,819	25	143,390	1	8,150	.....	.....
New Mexico	1	23,000	.....	.....	17	68,850	23	371,940	.....	.....	20	161,640	20	54,110
New York	5	535,615	15	4,692,000	53	433,695	6	79,800	21	66,370	4	2,395	.....	.....
North Carolina	14	167,415	13	324,240	41	472,115	19	194,042	39	29,934	1	1,600	2	1,370
North Dakota	.....	.....	1	6,100	11	79,600	1	8,000	.....	.....	11	8,500	43	41,190
Ohio	33	582,038	74	2,740,664	79	640,290	20	127,103	26	42,325	.....	.....	.....	.....
Oklahoma	16	128,070	14	240,520	146	669,392	21	348,050	2	2,705	.....	.....	38	107,481
Oregon	.....	.....	6	11,230	21	66,400	30	107,400	3	600	5	14,900	5	7,900
Pennsylvania	10	1,461,356	36	1,444,405	69	595,930	24	218,200	5	12,100	4	1,400	1	900
Rhode Island	.....	.....	4	359,300	2	19,450	.....	.....	1	800	.....	.....	1	400
South Carolina	.....	.....	6	15,400	25	152,450	11	101,000	2	800	.....	.....	2	3,700
South Dakota	2	12,900	3	62,750	40	120,750	3	17,800	3	2,700	1	1,300	29	26,750
Tennessee	1	5,900	11	155,150	22	333,140	8	51,230	1	500	.....	.....	.....	.....
Texas	1	6,000	43	1,496,890	106	1,203,990	130	1,451,955	6	5,130	96	549,365	166	1,323,090
Utah	1	9,400	1	990	7	62,190	12	91,108	.....	.....	4	3,386	3	1,200
Vermont	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Virginia	1	5,000	9	191,320	30	62,500	6	31,480	1	300	1	100	.....	.....
Washington	5	15,875	6	36,970	5	30,980	48	150,565	1	300	18	18,795	4	4,122
West Virginia	.....	.....	1	14,000	5	38,600	.....	.....	.....	.....	6	1,164	.....	.....
Wisconsin	15	298,220	46	1,038,700	98	298,205	60	261,775	8	12,395	8	5,685	5	4,215
Wyoming	2	18,800	.....	.....	4	51,300	.....	.....	2	500	4	3,450	13	23,313
MAJOR DRAINAGE BASINS														
Northeast	5	156,975	10	488,050	65	652,980	13	339,750	55	334,100	10	16,461	1	400
North Atlantic	41	2,317,591	65	7,175,780	148	1,893,675	37	348,999	37	172,490	5	10,050	1	900
Southeast	20	530,415	36	717,940	142	1,084,455	117	708,977	61	44,513	5	8,120	14	31,300
Tennessee River	.....	.....	7	75,150	18	278,135	6	36,330	3	950	.....	.....	1	570
Ohio River	40	891,122	96	2,022,540	177	1,136,890	62	415,062	28	34,865	9	2,164	1	900
Lake Erie	14	105,723	40	1,997,534	25	109,015	7	37,708	7	12,320	.....	.....	.....	.....
Upper Mississippi	44	1,350,870	119	6,048,770	468	1,735,286	178	807,207	88	82,327	13	9,085	45	66,315
Western Great Lakes	22	539,029	48	1,472,220	61	429,623	27	171,905	16	64,875	3	6,310	3	2,550
Missouri River	17	641,950	66	316,236	305	809,200	28	235,123	69	58,443	35	28,850	131	133,774
Southwest-Lower Mississippi	22	246,197	33	568,520	348	1,481,001	86	794,792	21	19,425	27	107,995	99	220,568
Colorado River	5	54,860	4	255,215	9	53,290	11	132,300	4	25,300	27	101,724	42	88,732
Western Gulf	2	29,000	42	1,382,690	100	1,101,030	134	1,617,945	5	4,730	94	658,875	158	1,319,460
Pacific Northwest	8	48,875	15	79,850	29	120,080	88	338,065	4	900	25	34,245	13	16,035
California	11	389,700	22	2,438,075	59	371,109	52	445,110	.....	.....	169	902,155	93	392,723
Great Basin	4	18,000	.....	.....	10	77,247	14	105,644	.....	.....	39	80,271	29	87,615
Total	255	7,320,307	603	25,038,570	1,964	11,333,016	860	6,534,917	398	855,238	461	1,966,305	631	2,362,842

Table 9. *Summary of chlorination, grease and grit removal, and sludge processing by population groups, States and drainage basins*

	Plants with chlorination		Plants with grease removal		Plants with grit removal		Septic tanks (number of plants)	Imhoff tanks (number of plants)	Stage digestion (number of plants)	Separate digestion (number of plants)	Sludge beds (number of plants)	Lagoons (Number of plants)	Mechanical methods (number of plants)	miscellaneous (number of plants)	None or no organized method (number of plants)
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served									
Population Size Groups															
Under 500	146	80,515	.....	.....	15	10,485	264	327	2	103	374	4	.....	10	424
500–1,000	246	182,320	3	2,420	74	56,855	289	648	5	272	940	15	2	15	357
1,000–5,000	921	2,177,417	20	56,323	555	1,402,394	490	1,432	56	1,270	2,609	41	17	52	778
5,000–10,000	340	2,365,174	17	119,840	314	2,345,284	52	200	47	517	716	17	25	22	108
10,000–25,000	292	4,082,876	22	333,290	296	4,111,507	20	92	83	372	459	34	46	28	68
25,000–50,000	127	3,991,809	15	539,495	133	4,262,292	3	22	44	113	123	23	39	30	19
50,000–100,000	54	3,365,985	12	635,170	76	5,172,972	.....	16	12	58	59	10	23	18	13
Over 100,000	90	21,589,139	12	4,990,501	118	34,352,608	2	22	23	85	62	23	45	51	24
States															
Alabama	18	118,740	.....	.....	12	317,525	54	30	1	35	58	1	.....	.....	61
Arizona	7	290,000	.....	.....	10	326,652	18	17	5	22	32	.....	.....	2	50
Arkansas	14	91,850	.....	.....	14	112,570	13	32	6	66	99	.....	1	1	19
California	140	6,021,330	11	350,638	35	4,973,640	78	102	26	214	283	6	7	20	150
Colorado	11	657,720	.....	.....	20	768,094	24	27	3	38	67	2	.....	4	37
Connecticut	33	718,630	.....	.....	29	1,054,660	18	6	4	17	30	3	11	7	23
Delaware	7	19,520	.....	.....	1	150,000	1	3	.....	5	6	.....	.....	.....	5
District of Columbia	1	1,240,000	1	1,240,000	1	1,240,000	.....	.....	.....	1	.....	.....	1	1	.....
Florida	129	1,018,015	1	600	59	606,570	47	31	7	92	109	.....	4	40	59
Georgia	12	422,500	3	18,900	43	490,300	36	61	4	60	121	1	1	.....	42
Idaho	23	105,000	.....	.....	11	62,600	25	6	5	14	21	1	.....	7	30
Illinois	44	361,631	3	55,220	131	3,465,560	15	166	28	158	304	25	12	5	43
Indiana	60	1,348,732	.....	.....	77	1,813,057	7	36	6	88	100	21	8	16	12
Iowa	8	78,367	7	296,770	70	642,726	86	143	8	95	289	15	1	1	27
Kansas	1	45,000	2	69,900	18	479,800	4	172	32	41	227	11	.....	3	11
Kentucky	40	234,235	1	8,000	30	345,570	11	33	6	30	71	.....	2	2	11
Louisiana	39	275,542	.....	.....	16	177,500	9	42	3	19	55	2	.....	1	14
Maine	2	1,460	.....	.....	1	2,000	13	3	.....	.....	3	.....	.....	.....	17
Maryland	33	170,643	2	41,400	7	941,900	5	24	3	15	38	.....	4	1	10
Massachusetts	26	1,264,920	5	791,630	27	1,425,510	9	17	9	8	41	.....	2	2	24
Michigan	78	2,950,972	1	80,000	40	2,955,810	34	23	7	56	81	4	11	9	47
Minnesota	164	1,332,802	1	10,000	32	1,095,746	3	132	11	102	247	3	8	4	19
Mississippi	15	92,200	.....	.....	.....	.....	38	21	.....	13	29	.....	.....	.....	50

Missouri	11	38,100	2	79,490	32	241,175	38	93	4	85	167	2	5	16	87
Montana	6	27,690	.....	.....	5	52,550	34	9	4	7	28	.....	.....	.....	54
Nebraska	2	2,300	.....	.....	3	90,000	20	63	1	66	121	.....	.....	4	39
Nevada	6	129,925	.....	.....	6	92,300	10	5	7	7	15	1	.....	1	15
New Hampshire	8	27,750	.....	.....	4	37,400	6	7	.....	2	10	.....	.....	.....	5
New Jersey	176	1,952,281	.....	.....	48	2,891,603	26	54	5	111	159	.....	21	5	41
New Mexico	3	12,100	1	23,000	15	335,340	13	26	3	26	61	.....	.....	.....	8
New York	183	5,333,895	4	780,300	120	7,976,571	48	114	8	108	211	11	14	14	67
North Carolina	44	522,406	3	97,825	87	695,147	66	134	9	61	199	.....	2	.....	23
North Dakota	.....	.....	.....	.....	9	4,550	22	44	1	8	36	.....	1	1	70
Ohio	88	2,975,326	38	2,409,416	103	4,975,996	14	111	7	169	244	13	33	11	14
Oklahoma	13	162,020	.....	.....	41	552,262	28	125	1	91	209	1	.....	.....	86
Oregon	84	347,730	.....	.....	39	646,200	17	14	8	76	87	.....	4	.....	27
Pennsylvania	149	1,539,280	3	105,500	51	3,053,855	25	100	4	98	195	4	9	6	85
Rhode Island	11	495,010	2	76,000	9	476,710	4	1	.....	8	5	1	5	5	5
South Carolina	10	90,250	1	50,000	33	243,900	56	67	.....	38	93	.....	.....	.....	74
South Dakota	7	48,275	1	5,000	7	133,800	2	83	2	15	81	13	1	.....	33
Tennessee	36	491,690	.....	.....	6	322,315	1	34	.....	36	72	.....	1	.....	15
Texas	146	2,308,185	3	24,050	145	3,269,150	34	409	3	189	530	15	5	7	119
Utah	21	163,013	1	32,000	17	150,323	26	9	4	17	22	.....	.....	.....	86
Vermont	2	8,400	.....	.....	1	8,100	5	.....	.....	2	1	1	.....	.....	6
Virginia	71	720,895	1	13,000	15	650,450	14	39	.....	45	70	1	3	2	19
Washington	123	635,890	1	15,000	49	442,945	31	26	25	68	94	.....	6	8	53
West Virginia	10	126,745	.....	.....	4	97,800	14	11	1	3	11	.....	2	1	16
Wisconsin	99	797,470	2	3,400	45	1,608,365	12	40	.....	264	299	8	12	23	16
Wyoming	2	18,800	.....	.....	3	57,800	11	14	.....	6	11	1	.....	1	27
Major Drainage Basins															
Northeast	188	4,075,120	11	1,647,930	145	5,133,056	86	116	18	100	237	13	26	19	110
North Atlantic	441	8,980,889	6	1,374,900	142	14,312,683	62	185	14	276	452	8	43	24	151
Southeast	234	2,260,641	8	167,325	231	2,416,592	265	336	22	296	599	2	7	40	329
Tennessee River	25	406,485	.....	.....	11	328,200	16	30	.....	30	62	1	.....	.....	22
Ohio River	204	3,028,582	23	967,620	182	3,755,822	63	245	21	255	466	26	31	24	80
Lake Erie	52	1,958,166	17	1,474,796	59	2,668,631	7	29	3	70	87	6	13	3	10
Upper Mississippi	253	1,940,515	11	313,300	242	5,561,549	102	409	40	530	959	45	28	27	126
Western Great Lakes	148	3,841,692	3	132,090	76	4,568,825	40	60	10	157	269	9	20	22	60
Missouri River	30	753,820	3	75,000	70	1,279,253	130	390	25	202	572	24	4	17	228
Southwest-Lower Mississippi	94	772,842	2	79,390	169	1,598,271	91	413	32	247	636	9	3	10	147
Colorado	18	380,030	.....	.....	20	434,442	48	31	10	41	67	2	.....	4	84
Western Gulf	137	2,194,405	4	47,050	141	3,368,780	34	856	5	194	510	15	4	6	99
Pacific Northwest	230	1,124,910	1	15,000	160	1,153,745	75	44	39	160	304	2	10	10	112
California	135	5,997,837	11	350,638	34	4,970,640	68	93	26	199	261	5	7	17	135
Great Basin	27	199,305	1	32,000	19	163,908	33	22	7	33	51	1	.....	3	52
Total	2,216	37,835,235	101	6,677,039	1,521	51,714,397	1,120	2,759	272	2,790	5,342	167	197	236	1,781

II. ANALYSIS AND INTERPRETATION

General

In 1957, 11,131 communities in the United States had sewer systems serving 98.4 million persons. This was slightly more than 57 percent of the total estimated population of the country in that year. These sewer systems served communities having a census population of 102 million, of whom 96.4 percent were connected to the sewer systems.

Of the 98.4 million population sewered, 22.3 percent discharged raw sewage and 77.7 percent treated sewage. If minor treatment—less than sedimentation—is not considered as treatment, sewage from 75.8 percent of the population connected to sewers is treated.

The 76.4 million persons served by treatment resided in 8,066 separate communities and were served by 7,518 treatment plants. The majority, 61.8 percent, of these plants furnished secondary treatment, and served 56.7 percent of the population served by treatment. Secondary treatment plants served 44 percent of the total population connected to sewers.

States

The percent of census population in sewered communities connected to the sewer systems varied considerably among the States, ranging from 74.5 percent in New Hampshire to over 140 percent in Nevada. The percentages by States for this item are given in table 10, together with percentages of connected population from which sewage is discharged raw or treated for both 1945 and 1957. The percent of census population sewered exceeds 100 percent in some cases because 1957 estimated population served data are compared to 1950 census population data.

In 16 States the population served by treatment exceeds 90 percent of the total sewered population. This is twice as many States as reported such a high percentage in 1945. As noted above, treatment is provided for 77.7 percent of the population served by sewers. This nationwide figure is exceeded in 23 States. In 1945 the population served by treatment was less than 20 percent of the sewered population in 9 States, while in 1957 this had been reduced to 2 States, Maine and New Hampshire.

Geographical Areas

Census Bureau geographical area groupings have been used in table 11 for the purpose of analyzing general sewage works data. The States included in each group are listed in the footnotes of this table. The grouping of data on a geographic basis such as is used here is not entirely pertinent to evaluation of sewage works. However, the groups are

standard ones used for a variety of governmental statistics, and their use here permits comparisons to be made with data in other fields that might be pertinent to an analysis of a special problem. In addition, the States in each group afford some homogeneity of economic, industrial, and social patterns.

Table 10. *Percent of census population in sewered communities connected to sewers and raw and treated discharge—by States*

State	Population connected in sewered communities, percent of census population	Percent of connected population sewage discharged			
		Raw		Treated	
		1945	1957	1945	1957
Alabama	78.7	52.0	47.9	48.0	52.1
Arizona	129.6	9.1	4.4	90.9	95.6
Arkansas	82.0	47.3	40.6	52.7	59.4
California	107.6	26.5	2.3	73.5	97.7
Colorado	114.6	14.4	5.9	85.6	94.1
Connecticut	88.0	23.9	7.8	76.1	92.2
Delaware	95.6	81.4	8.0	18.6	92.0
District of Columbia	(1)				
Florida	91.0	53.5	25.9	46.5	74.1
Georgia	83.7	40.3	39.5	59.7	60.5
Idaho	89.5	76.2	53.2	23.8	46.8
Illinois	96.5	6.7	5.0	93.3	95.0
Indiana	98.0	29.3	16.4	70.7	83.6
Iowa	85.9	31.2	28.3	68.8	71.7
Kansas	101.8	30.0	20.3	70.0	79.7
Kentucky	99.6	73.1	12.6	26.9	87.4
Louisiana	88.6	79.5	73.0	20.5	27.0	
Maine	84.9	97.7	89.1	2.3	10.9
Maryland	(1)	8.3	4.0	91.7	96.0
Massachusetts	87.5	38.3	29.2	61.7	70.8
Michigan	97.8	18.7	14.7	81.3	85.7
Minnesota	83.2	12.9	7.7	87.1	92.3
Mississippi	84.3	74.8	67.3	25.2	32.7
Missouri	84.9	81.0	73.0	19.0	27.0
Montana	98.7	71.2	55.0	28.8	46.0
Nebraska	91.2	53.8	51.8	46.2	48.2
Nevada	141.8	4.0	5.1	96.0	94.9
New Hampshire	74.5	89.9	81.2	10.1	18.8
New Jersey	98.0	21.4	2.3	78.2	97.7
New Mexico	134.7	0.5	0.2	99.5	99.8
New York	99.6	37.6	29.3	62.4	70.7
North Carolina	99.6	35.5	30.1	64.5	69.9
North Dakota	93.6	16.7	20.3	83.3	79.7
Ohio	102.4	33.0	17.8	67.0	82.2
Oklahoma	89.8	21.7	4.4	78.3	95.6
Oregon	98.7	81.6	8.1	18.4	91.9
Pennsylvania	89.6	72.9	42.0	27.1	58.0
Rhode Island	84.0	18.1	0.7	81.9	99.3
South Carolina	89.7	41.9	41.2	58.1	58.8
South Dakota	98.3	18.1	15.3	81.9	84.7
Tennessee	99.8	82.4	54.2	17.6	45.8
Texas	96.9	8.0	2.0	92.0	98.0
Utah	103.7	86.8	59.5	13.2	40.5
Vermont	84.3	94.8	78.1	5.2	21.9
Virginia	98.8	72.1	34.3	27.9	65.7
Washington	102.7	79.3	57.6	20.7	42.4
West Virginia	86.4	89.6	75.3	10.4	24.7
Wisconsin	97.2	8.7	3.9	91.3	96.1
Wyoming	104.1	63.9	36.0	36.1	64.0
Total	96.4	37.3	22.3	62.7	77.7

[1] These percentages are not shown, since they are unrealistic due to the effect of the Washington Suburban Sanitary Commission discharging to the District of Columbia plant.

On this basis the variations in percentage data are materially reduced. Only in the Pacific area does the percent of sewered population connected to treatment facilities exceed 90 percent. The corresponding low percentage is for the East South Central group where 55.7 percent is served by treatment. This latter figure compares with only 31.3 percent treated in 1945 in the same group of States, indicating substantial progress.

Table 11. *Population served by sewers and sewage treatment—by geographical areas*

Geographical area	1950 census population of sewered communities	Estimated population connected to sewers	Percent of census population connected to sewers	Percent of national total population connected to sewers	Percent of connected population—sewage discharged	
					Raw	Treated
New England [1]	7,457,052	6,438,212	86.3	6.5	30.7	69.3
Middle Atlantic [2]	24,880,112	23,888,535	96.0	24.3	28.6	71.4
South Atlantic [3]	10,073,854	9,541,001	94.7	9.7	27.6	72.4
East North Central [4]	22,644,009	22,298,605	98.5	22.7	11.3	88.7
East South Central [5]	4,540,363	4,136,957	91.1	4.2	44.3	55.7
West North Central [6]	8,548,368	7,556,663	88.4	7.7	36.9	63.1
West South Central [7]	8,686,785	8,097,385	93.2	8.2	16.5	83.5
Mountain [8]	3,112,949	3,530,294	113.4	3.6	22.2	77.8
Pacific [9]	12,104,220	12,873,744	106.4	13.1	9.3	90.7
Total	102,047,712	98,361,396	96.4	100.0	22.3	77.7

[1] Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
[2] New York, New Jersey, Pennsylvania.
[3] Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida.
[4] Ohio, Indiana, Illinois, Michigan, Wisconsin.
[5] Kentucky, Tennessee, Alabama, Mississippi.
[6] Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas.
[7] Arkansas, Louisiana, Oklahoma, Texas.
[8] Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada.
[9] Washington, Oregon, California.

Drainage Basins

Analytical data for the major drainage basins used in this report are presented in table 12. The North Atlantic basin has 10.9 percent of the total sewered communities in the United States, but these contain 22.0 percent of the population. The Upper Mississippi basin has the largest percentage of communities, 13.9 percent. In the Western Gulf basin sewage from almost 98 percent of the sewered population is treated while in the Great Basin only 49.8 percent of the population is so served.

While the above data types are interesting in developing a national picture of pollution conditions, the administrative arrangements necessary to solve the remaining raw sewage discharge problem are pointed out in the community analysis portion of table 12. In the Ohio River Basin over 58 percent of the population is served by treatment—lower than the national average of 77.7 percent, but a reasonable figure when considered in light of what existed in this basin 10 to 12 years ago. Yet, 52 percent of the communities in the Ohio basin discharge all of their sewage raw. The administrative complexities of dealing with this substantial percentage of communities in the solution of their sewage problems are obviously greater in proportion than in some other drainage

areas. While enforcement of and compliance with pollution-control measures is along State lines, the development of the basin concept over the last 20 years makes comparisons of this type necessary for proper evaluation of program operations.

Table 12. *Percentage data for sewer systems and raw and treated discharge—by drainage basins*

Major drainage basins	Percent of U. S. total communities	Percent of census population connected to sewers	Percent of national total population connected to sewers	Percent of connected population—sewage discharged		Percent of total communities discharging		
				Raw	Treated	Raw	Treated	Both raw and treated
Northeast	8.0	90.7	9.9	27.3	72.7	49.4	48.0	2.6
North Atlantic	10.9	97.6	22.0	21.5	78.5	28.5	70.8	.7
Southeast	10.0	88.1	6.6	35.9	64.1	27.3	71.2	1.5
Tennessee River	1.3	108.5	1.0	46.2	53.8	43.4	53.1	3.5
Ohio River	12.2	95.6	9.7	41.7	58.3	52.0	46.8	1.2
Lake Erie	1.9	103.2	3.0	5.0	95.0	30.0	68.2	1.8
Upper Mississippi	13.9	91.8	12.1	14.7	85.3	17.5	82.3	.2
Western Great Lakes	5.1	97.8	6.4	10.9	89.1	34.0	65.7	.3
Missouri River	10.1	96.1	4.1	38.0	62.0	23.8	75.6	.6
Southwest-Lower Mississippi	8.4	91.9	5.8	34.8	65.2	17.8	82.1	.1
Colorado River	1.7	127.6	.8	6.7	93.3	15.4	84.1	.5
Western Gulf	5.6	98.1	5.1	2.2	97.8	2.7	97.3	.....
Pacific Northwest	4.2	100.6	2.8	42.5	57.5	28.2	69.8	2.0
California	5.5	107.5	10.5	2.0	98.0	5.6	94.1	.3
Great Basin	1.2	105.2	.7	50.2	49.8	25.9	73.4	.7
Total	100.0	96.4	100.0	22.3	77.7	.....	.....	.....

Population Groups

Table 13 presents data showing the percentage distribution among the various groups for sewered communities, census population of these communities, connected population, populations discharging raw and treated sewage, and number of treatment plants.

Disposal facilities of communities in group 8 or of sanitary districts classed in this group serve 53.2 percent of the total United States sewered population, approximately the same percentage as in 1945. However, this same group accounts for only 1.0 percent of the sewered communities in the United States, and for 2.2 percent of the total treatment plants.

In general, the percentage data developed in this table closely parallel similar data for 1945. The major difference is in the percent of total sewered communities for those of less than 500 population. This increased to 11.3 percent in 1957 from 8.8 percent in 1945.

The percent of census population connected to sewers within each group, together with the percent of population discharging raw and treated sewage for both 1945 and 1957, is given in table 14.

For 1957, there are no discernible patterns for percent of census population served by sewers, whereas, in 1945, there were increasing percentages with increasing community size except for group 1.

In 1945, three of the groups bettered the national percentage of treated discharge, while in 1957 only group 8 exceeds the national average. However, all groups have experienced substantial increases in the percent of sewered population served by treatment plants. The largest such increase was in group 7, where the percentage increased from 54.3 in 1945 to 74.6 percent in 1957.

Table 13. *Percentage data for sewer systems and raw and treated discharge—by population groups*

Population size groups	Percent of total number of sewered communities	Percent of 1950 census population of sewered communities	Percent of total population connected				Percent of total number of treatment plants
			To sewer systems	To raw discharge or treatment facilities [1]	To raw sewage discharge facilities	To sewage treatment facilities	
Under 500	11.3	0.4	0.4	0.4	0.4	0.4	10.7
500–1,000	17.6	1.4	1.3	1.2	1.6	1.1	17.6
1,000–5,000	46.8	12.7	10.9	9.7	12.7	8.9	46.1
5,000–10,000	11.4	8.6	8.6	7.4	7.9	7.2	11.5
10,000–25,000	8.0	13.2	13.9	11.3	12.4	11.0	7.9
25,000–50,000	2.7	10.0	10.5	8.2	9.6	7.8	2.7
50,000–100,000	1.2	9.2	9.7	8.6	9.8	8.3	1.3
Over 100,000	1.0	44.5	44.7	53.2	45.6	55.3	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Percent of total connected population discharging through sewer outfall facilities of the population group.

Table 14. *Percent of census population connected to sewers and population discharging raw or treated sewage within population groups*

Population size groups	Percent of census population in sewered communities connected to sewers		Percent of connected population discharging			
			Raw		Treated	
	1945	1957	1945	1957	1945	1957
Under 500	92.7	112.1	35.7	25.5	64.3	74.5
500–1,000	77.1	90.1	[1] 35.5	29.2	[1] 64.3	70.8
1,000–5,000	77.6	82.5	[2] 39.1	29.1	[2] 60.8	70.9
5,000–10,000	83.4	96.5	42.0	23.8	58.0	76.2
10,000–25,000	88.0	101.3	43.7	24.4	56.3	75.6
25,000–50,000	95.7	100.7	41.8	26.0	58.2	74.0
50,000–100,000	96.7	101.4	45.7	25.4	54.3	74.6
Over 100,000	95.3	96.9	33.0	19.1	67.0	80.9
Total	91.1	96.4	37.3	22.3	62.7	77.7

[1] 0.2 percent discharging through semipublic facilities not included.
[2] 0.1 percent discharging through semipublic facilities not included.

Comparison with Prior Data

Selected comparative data from earlier statistical summaries are presented in table 15. The 1957 Inventory shows an increase of 2,214 community sewer systems and almost 24 million persons served over the 1945 data. These represent increases of 24.8 and 31.6 percent, respectively. The increase in population served by treatment facilities was 63.1 percent during this same period, while there was a decrease of 21.4 percent in the number of persons connected to raw sewage discharges.

Table 15. *Comparative data for 1940–57 for sewage disposal systems*

	1940	1945	1948	1949	1957
Number of sewered communities	8,516	8,917	(*)	(*)	11,131
Census population	[1] 75,728,000	[1] 82,012,692	(*)	(*)	[2] 102,047,712
Estimated population connected	70,506,000	[7] 74,740,887	76,680,685	78,850,870	98,361,396
Percent of census population connected	93.1	91.1	.....	.....	96.4
Raw discharge:					
Number of communities	[3] 3,597	[4] 3,610	[3] 3,800	[3] 3,718	[3] 3,165
Estimated population served	29,889,000	27,867,783	27,982,490	28,067,350	21,917,665
Percent of total sewered population	42.4	37.3	36.5	35.6	22.3
Treated discharge:					
Number of Communities	[5] 5,085	[4] 5,480	(*)	(*)	[6] 8,066
Estimated population served	40,617,000	46,865,114	48,698,195	50,783,520	76,443,731
Percent of total sewered population	57.6	62.7	63.5	64.4	77.7

* Data not available.
[1] 1940 census data.
[2] 1950 census data.
[3] Includes 166 communities discharging both raw and treated sewage.
[4] Includes 173 communities discharging both raw and treated sewage.
[5] Includes communities where only part of sewage is discharged untreated.
[6] Includes 100 communities discharging both raw and treated sewage.
[7] Includes 7,990 population discharging through semi-public facilities and not included in discharge data.

Since 1940 the percentage of total sewered population connected to raw discharge facilities has declined almost one-half. While this indicates substantial progress, the decline in total population in this category for 1940–1957 has only been 26.7 percent. The obvious conclusion is that treatment has been keeping abreast of population increases, but that it has not made substantial reductions in the population discharging raw sewage during the last 17 years. Tentative estimates based on these data indicate there has even been a small increase in population equivalents from community systems discharged to the streams of the Nation.

Table 16 presents data for 1940, 1945, and 1957 relating to population served and population discharged to the stream based on assigned percentage reductions for the various degrees of treatment. These reductions were derived from population equivalent data reported in the 1957 Inventory for approximately 56 percent of the sewered population. Table 16 is based on "population" only, since comparable population equivalent data are not available for years earlier than 1957.

Table 16. *Sewage discharge to watercourses in 1940, 1945, and 1957*

Treatment	Assigned percent reduction	Estimated population discharged—1000's		
		1940	1945	1957
None	0.0	29,889	27,868	21,918
Minor	.0	3,288	4,270	1,860
Primary	31.3	10,396	11,798	17,633
Intermediate	45.5	2,201	2,051	3,047
Secondary	82.5	3,178	3,790	7,582
Total	.....	48,952	49,777	52,040

This analysis indicates that an increase of 4.5 percent in the total population discharged to streams occurred in the period 1945–1957, and that an increase of 6.3 percent occurred during the 1940–1957 period.

Even with the remarkable increases in population served by sewage treatment since 1945, the fact that sewage from over 52,000,000 persons is still discharged to the Nation's streams is cause for reflection as to the efficacy of current pollution-abatement programs.

Preliminary population equivalent data extrapolated for the entire sewered population indicate that community sewer systems receive in excess of 140 million population equivalents. These same preliminary adjustments further indicate that approximately 75 million population equivalents are discharged to streams. This entire group of data is being subject to special study which will be reported in a later paper.

Development of Community Sewer Systems

During the years since World War II, there has been a marked increase in the urban population with the concomitant development of the so-called metropolitan area. Data presented by Hyde (4) indicate that in the urban population a lag of 5 to 8 million persons not served by community sewer systems has existed since 1860. In 1945 (3) the lag was approximately 7 million persons. The data in this summary indicate a lag of only 3.7 million persons. While the census population used for comparison is mainly for 1950, the application of a ratio of 1957 to 1950 census data for the entire United States would increase the lagged population to only slightly over 4 million persons. In addition, the percent of total United States population sewered in 1957 increased to 57.5 percent from approximately 53 percent for 1940 through 1949. Table 17 presents information showing the development of community facilities.

These two facts tend to indicate that the new urban population is being connected to sewer systems as it develops, and that some headway has been made in reducing the population resident in urban areas but not served by the community sewer systems.

Over 2,200 communities have installed sewer systems since 1945, an increase in number of almost 25 percent. The corresponding increase in sewered population is almost 32 percent. The increase from 1945 to 1957 in the census population of sewered communities is slightly less than 25 percent. Since the sewered population increase is substantially greater than the corresponding increase in census population of sewered communities, further credence is given to the statement that there is a trend toward reduction of the population in urban communities not connected to sewer systems.

As would be surmised, the preponderance of sewered communities is in the smaller population size groups. Almost 76 percent of sewered communities had less than 5,000 population, and 95.1 percent had less than 25,000. Contrasted to this, the large populations served are in the larger population size groups. The communities of over 100,000 popu-

lation comprise only 1.0 percent of the total communities yet they furnish 44.7 percent of the population connected to sewers, and serve over 53 percent of this population through their raw discharge or treatment facilities. These percentages are slightly less than those in 1945. These data are shown in table 13, and accumulated percent data for 1945 and 1957 are shown in table 18.

Table 17. *Development of sewer systems in the United States*

Year	Total United States population—millions	Sewage facility development	
		Numbered of sewered communities	Population served by sewers — millions
1860 [1]	31.4	10	1.0
1870	38.6	100	4.5
1880	50.2	400	9.5
1890	62.9	450	16.1
1900	76.0	950	24.5
1910	92.0	1,600	34.5
1920	105.7	3,000	47.5
1930	122.8	5,100	61.5
1935	132.0	6,800	69.5
1940 [2]	132.7	8,516	70.5
1945 [3]	139.6	8,917	74.7
1948 [4]	[5] 144.6	(6)	76.7
1949 [4]	[5] 149.2	(6)	78.9
1957	[5] 171.2	11,131	98.4

[1] Data for 1860 to 1935, inclusive, from Hyde, C. G.: Modern Sewage Disposal. Federation of Sewage Works Associations, 1938, pp. 1–14.
[2] Data for 1940 from (2). "Number of communities corrected from 8,518."
[3] Data for 1945 from (3).
[4] Data for 1948 and 1949 from unpublished U. S. Public Health Service data.
[5] July 1 data, estimated by Census Bureau, Current Population Reports, Series P–25.
[6] Not available.

Table 18. *Percent of total sewered communities and connected population by population groups*

Population size groups	Communities sewered (accumulated percent of total)		Estimated connected population (accumulated percent of total)	
	1945	1957	1945	1957
Under 500	8.8	11.3	0.3	0.4
500–1,000	27.6	28.9	1.6	1.7
1,000–5,000	76.3	75.7	11.9	12.6
5,000–10,000	87.6	87.1	19.7	21.2
10,000–25,000	95.3	95.1	31.9	35.1
25,000–50,000	97.7	97.8	41.6	45.6
50,000–100,000	98.9	99.0	51.2	55.3
Over 100,000	100.0	100.0	100.0	100.0

The data in table 18 present some interesting items. Other than in the smallest two groups the accumulated percentages of total number of sewered communities were practically the same in 1957 as in 1945, while some rather significant divergences are apparent in the accumulated percentages of estimated populations connected to sewer systems. While the increase in number of sewered communities appears to have been distributed among the several groups proportionate to conditions existing

in 1945, the connected population increase has been proportionately larger in the communities between 5,000 and 50,000.

In the 1945 summary (3) it was pointed out that while the largest community group (over 100,000 population) was the dominant one with respect to population served, the practice in the communities of this group was, in almost every case, a special problem, and, that this does not represent sewage works practice in the United States. This statement is just as pertinent when the 1957 data are considered, and may be even more so when some of the above facts are considered.

Sanitary Districts and Communities Serving Others

As reported in the 1957 Inventory, over 20.1 million persons in the United States were served by raw discharge or treatment facilities of other communities or sanitary districts. This is a 65-percent increase over similar data in 1945. With respect to special districts which discharge sewage from the majority of the population included in the 20.1 million figure, it should be noted that only those districts are included which were reported as such by the States as separate inventory listings. There are undoubtedly other such districts, many of whose boundaries are conterminous with the community they serve, whose existence as such has not been reported, and hence are not reported in this summary.

While some of the increase in population served by other communities and/or special districts may be ascribed to better reporting, the conclusion is obvious that this method of sewage disposal is being resorted to much more frequently. In table 19 the percentage interchange of population among communities for 1945 and 1957 are shown. There has been a substantial increase in population served by other communities or sanitary districts for the communities in the smaller groups, and a concomitant rise in the population received by facilities of the largest group for disposal. It may well be argued that this is a gratifying development, since larger plants are normally better operated and designed more rationally. However, the situation still remains that most of the smaller communities are so situated that they cannot avail themselves of such favorable circumstances as connection to larger systems. Their problems are no less real, however, and invite the concern of official agencies.

Type of Sewers

Data from over 10,500 communities reported in the inventory indicate that 82.1 percent are served by separate sewer systems, 13.8 percent by combined sewer systems, and the remainder have both separate and combined sewers. Table 20 shows the percentage of each type sewers within each population group. During the period 1945 to 1957 there was an actual decrease in the number of communities reporting combined sewer systems, with practically all of the increase being reported for communities having separate sewers. It appears that the trend is toward separate systems, exclusively.

Table 19. *Percent of sewered population served by or serving others—by population groups*

	Year	Population size groups							
		Less than 500	500–1,000	1,000–5,000	5,000–10,000	10,000–25,000	25,000–50,000	50,000–100,000	Over 100,000
Percent of sewered population served by raw discharge or treatment facilities of others	1957	12.8	6.9	11.9	16.3	22.9	27.7	25.1	20.4
	1945	7.6	3.7	6.2	10.8	14.0	20.9	17.6	19.2
Percent of population served from other communities	1957	0.2	0.6	1.9	2.8	5.1	7.6	15.2	33.0
	1945	2.5	0.3	1.9	2.5	2.7	6.3	11.2	26.4

Table 20. *Percent of each type of sewer within population groups*

Population size groups	Percent [1] of communities with—		
	Separate sewers	Combined sewers	Both separate and combined sewers
Under 500	92.8	6.6	0.6
500–1,000	86.3	12.4	1.3
1,000–5,000	83.9	13.2	2.9
5,000–10,000	77.2	16.3	6.5
10,000–25,000	73.1	17.1	9.8
25,000–50,000	60.9	24.0	15.1
50,000–100,000	50.4	34.6	15.0
Over 100,000	45.6	33.3	21.1
Total	82.1	13.8	4.1

[1] Percent of known cases.

TREATMENT

More than 76 million persons in the United States were served by 7,518 treatment plants in 1957. Table 1 shows the number of plants and population served for each degree of treatment, together with corresponding percentages.

Secondary treatment serves the largest number of persons and accounts for almost 57 percent of all plants. Since 1945 there has been a 100-percent increase in the number of persons served by secondary treatment and a two-thirds increase in the number of secondary plants. These percentage-change data, together with other available comparative data for the years 1940 to 1957, are shown in table 21.

Significantly, there have been decreases since 1949 in the numbers of plants for all degrees of treatment other than secondary, and substantial decreases in the number of persons served by treatment of less than sedimentation for both the 1949–1957 and 1945–1957 periods.

The percentage distributions within population groups and drainage basins for number of plants and population served for the various degrees of treatment are presented in tables 22 and 23, respectively.

With respect to population groups, and with the exception of intermediate treatment, no significant patterns are discernible. Intermediate

treatment frequency increases as does the size of community as to both numbers of plants and populations served.

On the other hand, there are quite significant differences in practice among the drainage basins. In the Western Gulf basin almost 97 percent of the population connected to treatment is served by secondary plants, compared with less than 23 percent so served in the Northeast basin. The Missouri River basin has the highest percentage of population served by intermediate treatment, while the Pacific Northwest basin reports the greatest percentage served by primary treatment. There appears to be some correlation between the degree of treatment and the degree of industrialization with possible correlation, also, with population density or degree of urbanization. Such an analysis, however, has not been made for this report, and any definite conclusions await further study.

Table 21. *Sewage treatment data—1940 to 1957*

NUMBER OF PLANTS

Degree of treatment	1940	1945	1948	1949	1957	Percent change [3]	
						1945–57	1949–57
Minor	49	60	51	54	41	(31.7)	(24.1)
Primary	2,889	2,829	2,984	3,019	2,730	(3.5)	(9.6)
Intermediate	2,630	98	106	107	100	2.0	(6.5)
Secondary		2,799	2,917	3,050	4,647	66.0	52.4
Total	[1] 5,580	5,786	6,058	6,230	7,518	29.9	20.7

ESTIMATED POPULATION SERVED—1000's

Minor	3,288	4,270	4,019	3,851	1,860	(56.4)	(51.7)
Primary	15,133	17,173	18,393	17,218	25,667	49.5	49.1
Intermediate	22,171	3,763	3,595	3,625	5,591	48.6	54.2
Secondary		21,659	22,691	26,090	43,326	100.0	66.1
Total	[2] 40,617	46,865	48,698	50,784	76,444	63.1	50.5

[1] Includes 12 plants—unknown treatment.
[2] Includes 25,000—unknown treatment.
[3] ( ) denotes decrease.

Primary Treatment

In 1957 there were 2,730 primary treatment plants in the United States serving almost 26 million persons. Table 2 shows the number of plants and estimated population served for the several types of plants, together with corresponding percentages.

Imhoff tank plants are the most numerous type, comprising almost 40 percent of all primary plants. In 1945, Imhoff tank and septic tank plants together comprised 83.5 percent of the total primary plants, and served 36.0 percent of the population. In 1957 these percentages had declined to 68.3 and 16.8 percent, respectively. While the number of Imhoff plants increased from 1945 to 1957, there was a 31.2 percent decrease in the population served. The corresponding decrease for septic tank plants was 25.5 percent.

Table 22. *Number of plants and population served by degree of treatment—percent of total within each population size group*

Population size groups	Total		Minor		Primary		Intermediate		Secondary	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Under 500	100.0	100.0	0.2	0.1	39.2	36.0	.....	.....	60.6	63.9
500–1,000	100.0	100.0	.3	.3	41.6	39.9	0.3	0.5	57.8	59.3
1,000–5,000	100.0	100.0	.4	.4	37.7	32.2	.6	.8	61.3	66.6
5,000–10,000	100.0	100.0	.4	.5	28.0	29.0	2.4	3.8	69.2	66.7
10,000–25,000	100.0	100.0	1.0	9.1	26.2	23.7	3.4	3.9	69.4	63.3
25,000–50,000	100.0	100.0	.5	.5	35.7	36.3	8.5	9.4	55.3	53.8
50,000–100,000	100.0	100.0	6.1	7.2	25.2	24.2	6.1	5.5	62.6	63.1
Over 100,000	100.0	100.0	3.1	1.3	37.8	37.2	7.3	9.7	51.8	51.8
Total	100.0	100.0	0.6	2.4	36.3	33.6	1.3	7.3	61.8	56.7

Table 23. *Number of plants and population served by degree of treatment—percent of total within each major drainage basin*

Major drainage basin	Total		Minor		Primary		Intermediate		Secondary	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Northeast	100.0	100.0	3.1	15.8	59.2	59.3	1.2	2.2	36.5	22.7
North Atlantic	100.0	100.0	2.1	3.2	41.4	32.5	2.2	12.3	54.3	52.0
Southeast	100.0	100.0	.9	1.4	60.5	36.1	.4	6.5	38.2	56.0
Tennessee River	100.0	100.0	.....	.....	62.4	36.4	.....	.....	37.6	63.6
Ohio River	100.0	100.0	.....	.....	35.7	25.1	3.4	11.0	60.9	63.9
Lake Erie	100.0	100.0	.....	.....	28.2	21.5	5.5	2.2	66.3	76.3
Upper Mississippi	100.0	100.0	.....	.....	24.7	9.6	.6	8.6	74.7	81.8
Western Great Lakes	100.0	100.0	.4	.1	43.8	55.1	6.0	8.6	49.8	36.2
Missouri River	100.0	100.0	.1	.1	28.0	13.6	1.0	24.2	70.9	62.1
Southwest-Lower Mississippi	100.0	100.0	.....	.....	30.0	19.0	.7	2.5	69.3	78.5
Colorado River	100.0	100.0	.....	.....	40.9	13.8	2.6	6.8	56.5	79.4
Western Gulf	100.0	100.0	.....	.....	16.1	3.1	.....	.....	83.9	96.9
Pacific Northwest	100.0	100.0	.9	1.1	47.4	61.9	.9	1.3	50.8	35.7
California	100.0	100.0	.7	1.2	27.9	56.4	1.0	2.7	70.4	37.7
Great Basin	100.0	100.0	.....	.....	26.0	14.5	1.9	2.1	72.1	83.4
Total	100.0	100.0	0.6	2.4	36.3	33.6	1.3	7.3	61.8	56.7

The increase in mechanically cleaned tank primary plants was substantial. They comprise almost one-fourth of all primary plants, but serve 72.7 percent of the overall population. From 1945 to 1957 they increased over 84 percent in numbers and 95.1 percent in population served.

Table 24 shows the percent of plants of various types as well as connected population within each population group. Table 25 reports the same data by drainage basins. In general, septic tank and Imhoff plants predominate in the smaller groups, with mechanically cleaned tank plants coming into major use in the communities of over 5,000 population. Considerable variation in practice exists among the various basins. In the Pacific Northwest basin over 93 percent of the population served by primary treatment is connected to plants with mechanically cleaned tanks. The corresponding figure is only 4.4 percent in the Western Gulf basin.

Intermediate and Secondary Treatment

Almost 49 million persons in the United States are served by 4,747 intermediate and secondary treatment plants. The activated sludge process is used in 589 plants serving 24.8 million persons—over 57 percent of the total population served by secondary treatment. Trickling filters, both standard and high rate, total 2,682 plants and serve over 15 million persons. Intermediate treatment is defined as chemical treatment with sedimentation in the absence of any secondary process. There are 100 such plants serving 5.6 million persons.

Percentage distribution within population groups and drainage basins for the various major secondary treatment processes are shown in tables 26 and 27. Activated sludge plants are the predominant type in cities of over 25,000 population. Standard rate trickling filters predominate in the communities under this size. The use of oxidation ponds is a major item in group 1—less than 500 population.

The distribution of plant types by drainage basins shows considerable variation in practice. In the Lake Erie basin, almost 55 percent of the plants are of the activated sludge type while in the Colorado River basin only 5.2 percent are reported. In this latter basin, 43.7 percent of the plants are oxidation ponds. Sand filters continue to be a major plant type only in the Northeast basin. High-rate trickling filters comprise a majority of 52.7 percent of the plants in the Pacific Northwest basin.

As explained in the introductory section, two types of data are presented concerning intermediate and secondary treatment. First is additive data where plants incorporating two or more processes have been arbitrarily assigned to a type of plant. In former summaries (2), (3) data were arranged on a unit process basis. This type of arrangement has been continued to present comparable data.

Comparative data are presented in table 28 for the years 1940, 1945, and 1957. The population served by the activated sludge process

Table 24. *Primary treatment—percent of types of plants and population served within population groups*

Population size groups	Total		Septic tanks		Imhoff tanks		Mechanically cleaned tanks		Plain hopper bottom tanks		Tank—no detail		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Under 500	100.0	100.0	48.3	40.1	42.6	50.4	4.7	6.0	2.8	2.3	0.6	0.9	1.0	0.3
500–1,000	100.0	100.0	34.0	29.5	48.4	42.9	9.8	13.3	4.4	4.5	.9	1.1	2.5	2.7
1,000–5,000	100.0	100.0	29.3	24.6	44.0	39.1	19.2	28.0	2.7	2.7	2.1	2.6	2.7	3.0
5,000–10,000	100.0	100.0	15.7	9.3	24.4	15.7	50.0	65.3	1.6	1.5	2.5	3.2	5.8	5.0
10,000–25,000	100.0	100.0	9.6	5.0	14.1	13.3	67.9	74.1	2.6	2.6	2.6	2.9	3.2	2.1
25,000–50,000	100.0	100.0	2.8	2.5	14.1	10.8	70.4	77.9	1.4	.9	4.2	3.5	7.1	4.4
50,000–100,000	100.0	100.0	.....	.....	24.0	26.6	64.0	65.8	4.0	4.1	8.0	3.5	.....	.....
Over 100,000	100.0	100.0	3.2	Neg.	17.8	7.1	69.3	81.0	3.2	7.1	4.9	4.6	1.6	.2
Total	100.0	100.0	28.6	3.8	39.7	13.0	24.0	72.7	2.9	5.2	2.0	4.0	2.8	1.3

Table 25. *Primary treatment—percent of types of plants and population served within drainage basins*

Major drainage basins	Total		Septic tanks		Imhoff tanks		Mechanically cleaned tanks		Plain hopper bottom tanks		Tank—no detail		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Northeast	100.0	100.0	25.9	2.7	29.3	16.7	31.9	74.7	5.6	1.8	1.7	2.8	5.6	1.3
North Atlantic	100.0	100.0	17.6	3.2	35.3	12.3	26.4	59.3	4.6	21.8	7.3	1.6	8.8	1.8
Southeast	100.0	100.0	38.5	16.5	41.9	17.5	16.3	58.7	1.7	.8	.2	3.3	1.4	3.2
Tennessee River	100.0	100.0	22.6	8.3	47.2	30.7	15.1	48.3	1.9	.6	13.2	12.1	.....	.....
Ohio River	100.0	100.0	21.5	4.1	48.6	19.8	23.8	73.6	.....	.....	1.4	.2	4.7	2.1
Lake Erie	100.0	100.0	19.4	.6	54.8	75.2	22.6	23.9	.....	.....	3.2	.3	.....	.....
Upper Mississippi	100.0	100.0	18.2	4.6	42.0	11.6	35.3	82.4	4.2	1.1	.....	.....	.3	.3
Western Great Lakes	100.0	100.0	18.3	1.1	28.3	11.4	47.3	84.8	3.8	.2	1.5	1.7	.8	.8
Missouri River	100.0	100.0	30.5	23.1	56.4	34.1	8.6	38.9	1.2	1.4	.8	.5	2.5	2.0
Southwest-Lower Mississippi	100.0	100.0	31.3	12.2	41.2	20.5	15.8	61.2	6.7	2.9	3.3	2.5	1.7	.7
Colorado River	100.0	100.0	52.4	32.7	28.6	31.5	9.5	25.6	7.9	4.4	.....	.....	1.6	5.8
Western Gulf	100.0	100.0	17.8	10.1	74.3	73.3	2.0	4.4	1.0	2.9	1.0	.8	3.9	6.5
Pacific Northwest	100.0	100.0	35.9	3.4	19.2	3.2	43.6	93.2	1.3	.2	.....	.....	.....	.....
California	100.0	100.0	34.8	.5	11.3	.3	44.3	87.4	.....	.....	4.4	11.3	5.2	.5
Great Basin	100.0	100.0	59.2	49.8	25.9	22.6	14.9	27.6	.....	.....	.....	.....	.....	.....
Total	100.0	100.0	28.6	3.8	39.7	13.0	24.0	72.7	2.9	5.2	2.0	4.0	2.8	1.5

Table 26. *Secondary treatment—percent of types of plants and population served within population groups*

Population size groups	Total		Activated sludge		Trickling filter standard rate		Trickling filter high rate		Intermittent sand filter		Application to land		Lagoons		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Under 500	100.0	100.0	5.3	5.6	26.7	26.3	8.6	22.6	18.2	11.5	15.5	10.2	20.6	19.7	5.1	4.1
500–1,000	100.0	100.0	6.9	7.3	41.5	41.9	13.9	15.7	13.8	11.9	7.3	6.2	13.2	14.2	3.4	2.8
1,000–5,000	100.0	100.0	10.0	10.6	43.0	41.8	17.1	20.6	7.2	5.6	7.9	7.8	9.3	7.7	5.5	5.9
5,000–10,000	100.0	100.0	13.4	15.2	45.4	43.2	24.4	27.5	4.2	3.3	4.5	4.0	3.9	3.6	4.2	3.2
10,000–25,000	100.0	100.0	23.0	25.2	40.0	34.9	26.1	28.7	4.1	4.3	1.7	2.4	1.0	.9	4.1	3.6
25,000–50,000	100.0	100.0	36.4	39.7	28.2	22.7	27.3	28.5	1.8	1.2	3.6	5.5	1.8	2.4	.9	Neg.
50,000–100,000	100.0	100.0	48..	46.6	29.0	29.7	14.5	15.5	3.2	2.8	3.2	3.6	.....	.....	1.6	1.8
Over 100,000	100.0	100.0	61.2	87.6	28.2	8.4	8.2	3.8	.....	.....	.....	.....	2.4	.2	.....	.....
Total	100.0	100.0	12.7	57.1	40.2	21.6	17.5	13.8	8.5	1.9	7.3	2.3	9.2	1.8	4.6	1.5

Table 27. *Secondary treatment—percent of types of plants and population served within drainage basins*

Major drainage basins	Total		Activated sludge		Trickling filter standard rate		Trickling filter high rate		Intermittent sand filter		Application to land		Lagoons		Others and unknown	
	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served	Number of plants	Estimated population served
Northeast	100.0	100.0	7.0	20.4	39.8	27.5	7.7	19.7	37.8	20.6	2.8	Neg.	0.7	Neg.	4.2	1.8
North Atlantic	100.0	100.0	18.9	81.2	39.9	11.4	10.2	2.9	10.8	1.9	1.3	0.1	.3	Neg.	18.4	2.5
Southeast	100.0	100.0	10.2	31.0	37.6	40.7	30.3	25.0	16.7	1.9	1.4	.3	2.5	.6	1.4	.5
Tennessee River	100.0	100.0	18.8	19.2	56.2	78.6	12.5	1.7	9.4	.3	.....	.....	3.1	.2	.....	.....
Ohio River	100.0	100.0	25.7	58.9	45.2	31.0	16.4	11.4	7.4	1.0	2.5	.1	.3	Neg.	2.5	.6
Lake Erie	100.0	100.0	54.8	94.0	27.4	3.9	8.2	1.5	8.2	.5	.....	.....	.....	.....	1.4	.1
Upper Mississippi	100.0	100.0	13.4	72.5	52.0	18.1	18.7	7.8	10.2	1.0	1.2	.1	4.4	.3	.1	Neg.
Western Great Lakes	100.0	100.0	31.5	69.0	36.9	19.8	18.1	8.5	10.1	2.3	2.0	.3	.7	Neg.	.7	.1
Missouri River	100.0	100.0	10.7	20.4	49.0	51.2	4.4	15.1	11.2	3.8	3.7	1.2	20.0	8.1	1.0	.2
Southwest-Lower Mississippi	100.0	100.0	5.2	18.5	61.0	42.9	14.8	27.3	3.8	.7	3.8	2.9	9.9	4.5	1.5	3.2
Colorado River	100.0	100.0	3.5	46.3	10.3	9.7	12.6	24.1	4.6	4.6	25.3	2.8	43.7	12.5	.....	.....
Western Gulf	100.0	100.0	8.0	29.3	17.6	22.2	23.9	33.3	.9	.1	13.1	6.9	17.3	3.5	19.2	4.7
Pacific Northwest	100.0	100.0	9.0	14.0	16.8	20.9	52.7	39.2	2.4	.2	12.5	3.8	6.6	1.9	.....	.....
California	100.0	100.0	6.6	61.9	18.3	8.8	17.2	11.3	.....	.....	39.3	11.6	15.5	5.0	3.1	1.4
Great Basin	100.0	100.0	.....	.....	13.3	27.8	16.7	38.0	.....	.....	45.3	21.3	20.0	8.2	2.7	4.7
Total	100.0	100.0	12.7	57.1	40.2	21.6	17.5	13.8	8.5	1.9	7.3	2.3	9.2	1.8	4.6	1.5

Table 28. *Intermediate and secondary treatment processes—comparative data for 1940, 1945 and 1957*

Type of treatment	Number of plants			Estimated population served millions		
	1940	1945	1957	1940	1945	1957
Chemical treatment	185	197	255	4.0	5.3	7.3
Activated sludge	302	324	603	10.5	11.6	25.0
Trickling filter standard rate	1,486	1,459	1,964	8.4	8.8	11.3
Trickling filter high rate		122	360		.7	6.5
Intermittent sand filter	432	448	398	.9	1.0	.9
Application to land	394	422	461	.9	1.3	2.0
Lagoons	(*)	45	631	(*)	.3	2.4

*Not available.

Table 29. *Plants providing chlorination and grit removal by population groups*

Population size groups	Percent of total plants providing—			
	Chlorination		Grit removal	
	1945	1957	1945	1957
Under 500	15.1	18.1	2.3	1.9
500–1,000	15.4	18.6	3.9	5.6
1,000–5,000	19.7	26.6	9.5	16.0
5,000–10,000	29.8	39.4	22.9	36.4
10,000–25,000	36.5	49.1	32.5	49.7
25,000–50,000	33.3	63.8	36.9	66.8
50,000–100,000	32.4	54.5	52.1	76.8
Over 100,000	37.7	54.9	52.5	72.0
Total	21.8	29.5	13.2	21.0

increased from 11.6 to 25.0 million during the 1945–57 period. This represents the largest increase. The greatest percentage increase during this period was for oxidation ponds. The number of plants increased from 45 to 631, and the population served increased from 0.2 to 2.4 million.

Sludge Digestion

Units for the digestion of sewage sludge were classified under four headings: Septic tanks, Imhoff tanks, separate, and stage. Separate sludge digestion units increased over 100 percent from 1945, to a total of 2,790 plants. Imhoff tanks were used for sludge digestion in 2,759 plants. Separate digestion units comprised a majority of digestion facilities in plants located in communities of over 5,000 population. Imhoff tanks and septic tanks predominate in the smaller plants.

Sludge Dewatering

Sludge drying beds are reported in use at 5,342 plants—71.1 percent of all treatment plants. Over 1,700 plants are listed as not having sludge dewatering or other organized method of drying in use. The majority of these plants are small septic tank or Imhoff tank plants, where sludge is drawn infrequently. It is probable that some of the plants reported in

this category may have drying units that have not been reported in the inventory.

Chlorination

Almost 38 million persons are served by 2,216 plants incorporating chlorination facilities. This comprises 49.5 percent of the people served by treatment and 29.5 percent of the treatment plants. In 1945, comparable percentages were 34.2 and 21.8, respectively. The increase in population served since 1945 is 136.0 percent and in the number of plants is 75.6 percent.

As in 1945, New York and New Jersey have the largest number of plants equipped for chlorination—183 and 176 respectively. California and New York have the largest populations served by chlorination.

The provision of chlorination facilities increases as the size of community increases. Percentage data for 1945 and 1957 are shown in table 29. In group 1, only 18.1 percent of the plants have chlorination, while in group 8 almost 55 percent of the plants provide chlorination.

Grit Removal

The removal of grit from sewage is practiced at 1,581 treatment plants serving almost 52 million persons. While this represents only 21.0 percent of the treatment plants, they serve almost 68 percent of the population connected to treatment. Percentage increases from 1945 to 1957 were 106.7 and 86.1 percent for treatment plants so equipped and population served, respectively.

Comparative percentage data for 1945 and 1957 are shown in table 29 for the various population groups. Rather striking changes have occurred since 1945 in the plants serving communities of over 1,000 population. The percent of total plants having grit removal devices in these groups has increased substantially.

Grease Removal

Grease removal as an integral unit in the treatment process is reported to be in use at 101 plants in the United States, serving 6.7 million persons. This report indicates fewer persons served in 1957 than in 1945. It is considered that this item may be substantially underreported due to a confusion in the use of coding symbols in the inventory.

Acknowledgement

The data on which the inventory is based were furnished by the various State water pollution control agencies through the Regional Offices of the Public Health Service. Grateful acknowledgment is due the personnel of the State agencies for their cooperation in preparing the base data. In many instances, personnel of the Regional Offices assisted the official agencies, and appreciation is expressed for their very material efforts.

Since this activity has been conducted by the Public Health Service, the data preparation has been performed by Arthur D. Smart. His

valuable and loyal efforts over a period of almost 20 years have been a considerable factor in the success of the inventory.

NOTE.—The data presented in this report constitute only a small portion of the material prepared from the inventory. The population group data are a primary classification and were prepared as a single entity. The State data were synthesized from the data by population groups within each State, and the major drainage basin data were synthesized from the individual subbasin data.

These tables are available in the Washington headquarters office of the Public Health Service. Excerpted data will be made available to interested parties. In addition, a variety of special tabulations can be prepared on request.

Any correspondence relating to special tabulations or to the availability of unpublished data should be directed to: Water Supply and Water Pollutio. Control Program, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington, 25, D. C.

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